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ABSTRACT

The DALSTRA (DAlis/STRAsser) Inquiry Teaching Strategy is a model of teacher behaviors regarding teaching as a process composed of three categories of actions: basic behaviors, goal-directed behaviors, and diagnostic behaviors. The materials in this document were designed for use in an inservice education program in DALSTRA inquiry methods, and they discuss: (1) skills necessary for generating original data and working with primary and secondary data; (2) structural components of an inquiry lesson; (3) a taxonomy of teaching behaviors useful in facilitating the goals of inquiry; (4) student behaviors from which teachers develop inquiry teaching strategies; (5) the process of introducing students to the entire range of decision making in inquiry (data selection/evaluation, theory appraisal/hypothesis formation/evaluation, etc.); (6) teaching behaviors for helping students in the building of problem-directed data collections; (7) a case study of data generation, collation, and arrangement that illustrates a classroom exercise in historical inquiry; (8) inquiry skills in communication; (9) the purposes, processes, and products of historical inquiry and their application to the classroom setting; (10) the rationale for building inquiry into daily classroom activity; (11) the "process dialog" component of inquiry--the discussion of what, how, and why, as opposed to the actual doing of inquiry work; (12) developing students' repertoires of learning strategies; and (13) actions that teachers may take to draw from students further information concerning their inquiry processes and abilities. (MJB)

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Dalstra Inquiry Teaching Strategies
Inservice Education Program

TEACHING BEHAVIORS RELATED TO THE DALSTRA INQUIRY TEACHING STRATEGY

PART I *The Basic Teaching Behaviors*

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TEACHING BEHAVIORS RELATED TO THE DALSTRA INQUIRY TEACHING STRATEGY

INTRODUCTION

The most crucial element of any classroom is the teacher. It is what the teacher does and doesn't do that determines what the students will do; what they will learn. Of course, having the facilities which make it possible for the students to work in a variety of ways is important. In addition, the students and teachers must have the necessary materials and supplies to work with. And most certainly, both teachers and students need a pleasant place to work so they can give their full attention to the matters at hand. It is difficult, if not impossible, though, to find any educational research that suggests learning is more efficient, more effective, or that students feel better about themselves under such conditions alone. It's the teacher that counts. And the teacher is what the teacher does.

In general, what a teacher does as he or she teaches may be grouped into three categories: (1) the **BASIC TEACHING BEHAVIORS**: actions taken to establish and maintain open lines of student-student and student-teacher communication; (2) the **GOAL-DIRECTED TEACHING BEHAVIORS**: actions taken to help the students move toward the goals and objectives of the lesson; and (3) the **DIAGNOSTIC TEACHING BEHAVIORS**: actions taken to generate data about student growth toward those goals.

What follows in this paper and the following Parts II and III is a taxonomy of teaching behaviors useful in facilitating the goals of inquiry. These behaviors include:

THE BASIC TEACHING BEHAVIORS

- STRUCTURING (STR)
- FOCUS SETTING (FS)
- ACKNOWLEDGING (A)
- CLARIFYING (CL)
- RESPONDING TO STUDENT'S DATA GENERATING (RDG)
- TEACHER SILENCE (TS)

THE INQUIRY GOAL DIRECTED TEACHING BEHAVIORS

- PROBE FOR DATA (PD)
- PROBE FOR PROCESS/DATA SOURCE (PP/DS)
- SUGGESTING PROCESS/DATA SOURCE (SP/DS)
- DESIGNING PROCESS/DATA SOURCE (DP/DS
- TUNING IN TO PROCESS/PRODUCTS (TIP/P)
- PROBE FOR INTENT/FUNCTION (PI/F)

THE INQUIRY DIAGNOSTIC TEACHING BEHAVIORS

- PROBE FOR PROCESS AWARENESS (PPA)
- PROBE FOR PREDICTION/EXPLANATION (PP/E
- PROBE FOR STUDENT'S THEORY (PST)
- PROBE FOR STATUS OF STUDENT'S THEORY (PSST)
- PROBE FOR FEELINGS (PF)
- GIVING FREE DATA (GFD)
- GIVING THEORIES (GT)

Deciding which of these teaching behaviors a teacher uses at any moment is based on what the student does and where the student is in his or her development toward the instructional goals. How a specific teaching behavior is formulated – what words are used and what specific message is to be communicated – is a professional decision guided by several factors. These factors include who the students are that the teacher is working with at the time, school district policies, the school district curriculum, the classroom environment, specific needs and capabilities of individual students within the group, the teacher's knowledge of the content and processes of the specific discipline area of the problem, the relationship of today's lesson to what has preceded it and what will follow, and on, and on. It's easy to see why teaching is indeed a complex process. No wonder teachers go home tired at the end of the day!

As an illustration of different ways one of the Basic Teaching Behaviors might be formulated as a product of these various factors acting on the teacher, consider the following examples:

S: During work on the pulse glass problem, "Why does the liquid move from one side to the other?" A student responds with, "*I have something like that at home except the liquid goes from the bottom to the top.* (Reporting Data) *I wonder why the liquid in my thing goes up from the bottom to the top when you hold it?*" (Focus Setting)

T: *That's another kind of problem you've raised, Smirthwaite.* (Focus Setting) *You can work on that one right now if you'd like.* (Structuring)

In this case the teacher used a Structuring teaching behavior to make it legitimate for the student to work on the problem because the teacher knew it was related to the pulse glass problem. The teacher was also certain he or she could be a data source for that problem as well. The teacher also felt that the student's work on that problem wouldn't get in the way of the other student's work on the pulse glass.

Another teacher response to the same student behavior might be:

T *That's another kind of problem you've raised, Smirthwaite.* (Focus Setting) *If you'd like to bring that one in next week, we all might be able to work on it.* (Structuring)

In this instance the teacher used the Structuring teaching behavior to set the new problem aside for now, though he or she is committed to using the problem for classroom inquiry if Smirthwaite does bring the apparatus into the classroom. In this case the teacher knew what the apparatus was and was sure that either he or she would be able to serve as a data source for the students, or that data would be available.

And there might be a range of other ways the teacher might formulate a Structuring teaching behavior in response to the same situation. These may range from making the student's work on the problem legitimate at the moment, to ruling it out as a problem suitable for classroom inquiry. The same is true in formulating any teaching behavior. What words or actions are used by the teacher in implementing a given teaching behavior is influenced by many factors.

It is also important to point out that the Inquiry Teaching Behaviors outlined in this material may be utilized in any setting, whenever the student's growth as inquirers is a goal. Whether it's a total class lesson, a small group activity, a simulation, a game, a role playing situation, or an informal student-teacher dialogue in the classroom or on the playground, it's the teaching behaviors utilized that determines whether or not students will grow as inquirers. Mere opportunities "to do research" under the teacher's direction or to find and solve problems on their own just doesn't do it for most students. *It's what the teacher does that determines what the students will learn.*

Perhaps the most crucial competencies of the teacher concerned about teaching toward inquiry is the ability to prescribe, formulate, and use specific teaching behaviors wholly consistent with the outcomes for instruction sought. The purpose of our work has been to *identify* those teaching behaviors related to teaching toward inquiry; to label them, specify *when* they are most appropriately used, and report the *probable effect* of their use on students.

Within this setting, teachers can then think and talk about the various teaching behaviors, experiment with them in the classroom, and evaluate their effect. If teachers like what happens in their classrooms as a result, they'll know how to make them happen again. And making the good things happen again is what the professional educator is all about.

Teaching Toward Inquiry is more effective if the teacher knows what he or she is doing, and does it on purpose.

THE BASIC TEACHING BEHAVIORS

The **BASIC TEACHING BEHAVIORS** include the following purposes for behaving:

- STRUCTURING (STR)
- FOCUS SETTING (FS)
- ACKNOWLEDGING (A)
- CLARIFYING (CL)
- RESPONDING TO STUDENTS' DATA GENERATING (RDG)
- TEACHER SILENCE (TS)

Each of these teaching behaviors is described below:

STRUCTURING (STR)

Anytime a group of students and their teacher are at work in the classroom, the students must know what is expected of them, what they can expect of their teacher, and how they are to work. The teacher must communicate what they'll do, what the lesson is all about, what materials they'll use, how long they have, the climate of the lesson, etc., and take action consistent with this communication. In Teaching Toward Inquiry, the students must know at the outset that it is their responsibility to decide:

(1) What ideas or theories seem appropriate to the problem at hand;

(2) How they will test the appropriateness of their theories or ideas;

(3) To what degree their ideas or theories are useful as they are, or whether they should be rethought, modified or discarded;

(4) What is to be done next, including considering the problem solved for now or for good, stopping work on the problem for now, coming back to it at some later time, revising the theory and retesting it, or searching for a new theory.

The teaching behavior through which ways of working on the lesson and student-teacher and student-student role relationships are communicated and implemented is called Structuring. Structuring includes (1) communicating what the students will be doing and how they are to work, (2) presenting the teacher's reasons for the lesson structure as it is (3) taking action to implement the lesson structure, and or (4) adopting a change in the lesson structure as suggested by a student.

T *Today as we work we're going to be doing some things a bit differently than we have so far this semester. For this lesson we'll organize. . . I'm going to. . . Your job will be to. . . As we work we'll. . .*

T *You can carry out that experiment for yourself if you want to do so.*

T *You can think more about that before you go on, Bill. That's OK.*

T *Incidentally, when you're through for the moment let me know by saying something like, "That's all" or "I pass" or . . .*

T *Hold on, there seems to be a lot of talking going on at the same time and it's hard to hear. Could we please have one person talking at a time.*

T *Remember, if anyone wants to talk to others about the problem you can call for a "conference" and we'll give you a chance to do so.*

While working on a problem is essentially an individual matter (each student doing what he/she feels should be done within the lesson structure to solve it) the work takes place in a *social context*. The students state their ideas in the presence of other students. They also talk to their teacher and to other students about their ideas, data, and ways of working. The teacher must, therefore, take deliberate action to maintain open lines of communication among the students and between the students and himself or herself.

FOCUS SETTING (FS)

Fundamental to any inquiry is a problem to solve. Problems suitable for classoom inquiry may be posed by the teacher or the students. Focus Setting is when the teacher states a problem to be explored by the students, or when the teacher labels a problem presented by a student as a problem suitable for classroom inquiry. In this latter case, the Focus Setting teaching behavior should be followed with Structuring teaching behavior to let the student know if they are to work on the new problem now, later, or if they should forget about it.

T: *Why is it that the town of La Porte, Indiana gets 20% more precipitation than any of the surrounding towns?*

S: *Why is it that the train runs through there only once a day?*

T: *Yeah, that's another kind of problem you can work on.*

ACKNOWLEDGING (A)

In addition to creating the lesson structure and identifying the problem the students are to work on, another important aspect fundamental to maintaining open lines of communication in the classroom is a climate in which the students may state their ideas without being judged by the teacher. The Acknowledging teaching behavior is verbal or non-verbal communication that the teacher understands what a student has said; that his message has been understood without making a judgment about the appropriateness or validity of those ideas.

T: *I see what you're saying, O.K., Chick.*

T: *That's an interesting idea, Jane.*

T: *Uh-huh. It could be.*

T: *Oh, I understand. Thanks for sharing your idea with us. Would you like me to add it to Gus' and Chuck's theories here on the chart, Filbert?*

T: (Nods).

CLARIFYING (CL)

What the teacher does during the inquiry lesson is clearly a function of what it is the students do as they work. Therefore, in addition to his interests in and desire to understand the student's ideas, the teacher must be able to determine what kind of inquiry processes the students are using as they work. In using the Clarifying teaching behavior the teacher is seeking the student's help so he will be able either to understand what the student is saying or to be able to recognize what the student is doing. When the teacher uses a Clarifying teaching behavior, the behavior is used because he/she doesn't understand, not because he thinks other students didn't understand or because they need to hear what was said.

T: *Don, would you repeat your theory? I need to hear it again from you.*

T: *Eliza, are you saying that . . .?*

T: *I'm having difficulty in understanding your idea. What do you mean by . . .?*

Since in order to prescribe many of the teaching behaviors, the teacher may also use a Clarifying teaching behavior if he or she isn't sure what it is the student is doing: whether the student may be stating a theory, generating data, reporting data, etc.

RESPONDING TO STUDENT'S DATA GENERATING (RDG)

When the teacher uses the Responding to Student's Data Generating teaching behavior, he or she is taking some action to make it possible for a student to get the data he/she wants. The responding to Student's Data Generating giving that student the data requested, allowing him or her to implement the data generating process he/she has identified, or, making whatever arrangements are necessary for the student to get the data needed from the source the student has identified.

S: *I need to talk to some of the third graders who played in the kickball area to see what they saw out there during lunch time.*

T: *I'll talk to their teacher to see if we can make arrangements for you to talk to some of the students this afternoon. Is that O.K., Grant?*

T: *Yes, that is from inside the dunking duck.*

S: *I want to go down to the school library to check the atlas . . . or something — to see if I can find out what kinds of trees grow on the east and west sides of the Mississippi River. And I also want to look up steamboats to find out what kind of wood they used.*

T: *Let's see, the librarian is there now. You may go right now if you'd like to, or you can go during our open discussion period.*

T: *Steve, I believe the mayor stated that . . .*

S: *May I have the bottle? I'd like to tap it to see if it'll work for me.*

T: *Sure, go ahead.*

TEACHER SILENCE (TS)

The teacher uses Teacher Silence as a direct way to protect the students' rights and affirm that it's their responsibility to make their own decisions about how they'll work on the problem at hand. It is a non-verbal message to students that it is up to them to initiate their own action to solve the problem without some cue from the teacher about what they should do next. The Teacher Silence is used only as a response to student silence. The intended message to the students is that if they are to find out if their ideas are "good," they must initiate their own action to check those ideas out for themselves. It's up to them.

T:

S:

A SUMMARY OF COMMON ERRORS IN USING THE BASIC TEACHING BEHAVIOR

Any of the Basic Teaching Behaviors are used incorrectly when the teacher interrupts a student, i.e., the teacher talks before the student has an opportunity to complete his thought.

THE STRUCTURING (STR) teaching behavior is used incorrectly when:

- it is used in a "You should . . " context.
- The emphasis of the Structuring is on telling the students what they can't do rather than what they can do within the lesson structure.

THE FOCUS SETTING (FS) teaching behavior is used incorrectly when:

- The student uses a Focus Setting behavior, but the problem the teacher identifies is different from that reported by the student.

THE CLARIFYING (CL) teaching behavior is used incorrectly when the teacher uses it:

- To put words into a student's mouth. For example:

  S: *Heat did it.*

  T: *You're saying heat made the liquid change to a gas and the gas pushed it to the other side.*

- As a way to "mark time" while the teacher thinks - even though the student's message is clear.

THE ACKNOWLEDGING (A) teaching behavior is used incorrectly when:

- It is used only in instances when student's ideas are on the "right" track.
- The actual effect is to judge a student's ideas rather than to signify that the teacher understands what was said.

THE RESPONDING TO STUDENT'S DATA GENERATING (RDG) teaching behavior is used incorrectly when:

- The teacher responds with data other than, or in addition to, that sought by the student.

TEACHER SILENCE (TS) is used incorrectly when:

- Non-verbal cues (gestures, grimaces, etc.) are used while remaining silent.
- It is broken with other than a Probe for Feeling, Structuring teaching behavior.

Dalstra Inquiry Teaching Strategies
Inservice Education Program

STUDENT BEHAVIOR RELATED TO THE DALSTRA INQUIRY TEACHING STRATEGY

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STUDENT BEHAVIOR
RELATED TO
DALSTRA INQUIRY TEACHING STRATEGY

Helping students become effective inquirers doesn't just happen in the classroom. Achieving this end requires several teaching competencies. One of these is the ability to diagnose what it is the students are doing as they work to solve problems. What the student does is the base from which the teacher decides what he/she should do. Five student behaviors related to the *Dalstra* Inquiry Teaching Strategy have been identified. They are:

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FOCUS SETTING (FS)	1
DATA GENERATING (DG)	2
STATING THEORIES (ST)	3
REPORTING DATA (RD)	6
REPORTING PREDICTION (RP)	7

Each of these student behaviors is described in detail on the pages which follow.

FOCUS SETTING (FS)

In Focus Setting the student poses a problem he/she feels is suitable for inquiry. Implicit in the student's Focus Setting is the need to search for a theory, solution, or explanation as a response to it. When using a Focus Setting Behavior a student is usually involved in: (1) restating a problem identified by the teacher, (2) identifying a new or different problem for inquiry, (3) recognizing a problem identified by another student and labeling it as a problem for inquiry, or (4) probing another student to find out what problem he's working on.

S: *Why is it that the location of the major river cities on the upper Mississippi is different in pattern than the location of the major river cities on the lower Mississippi?*

S: *Why doesn't the pulse glass also work when it's upside down?*

S: *Hey Frank, when you said, "Why doesn't the pulse glass work when it's upside down?" you raised a whole new problem.*

S: *Madge, the things you're talking about sound like you're into another problem.*

DATA GENERATING (DG)

> DATA: A descriptive statement about some object, condition, event person, place, feeling . . .

In generating data the student either (1) initiates some action to produce original data about actual objects, events, or conditions, through observing, listening, experimenting, measuring, and so on, or (2) gleans data from primary or secondary data sources by reading, interviewing, and so on.

In using original data, the inquirer produces his or her own raw data through interaction with the environment on a first-hand basis. In using primary data, the inquirer works with raw data produced by someone else. And, in using secondary data, he/she works with data which has been produced, screened, and usually synthesized or summarized by someone else.

S: Charles picks up the pulse glass, holds it up in front of him and places his hand on the empty sphere. (Generating Original Data)

S: *Charley, what happened when you put your hand on the empty ball—when you experimented?* (Generating Primary Data)

S: *Ms. Jones, may I borrow that book you have about science experiments to see if there is anything in it about the pulse glass?* (Generating Secondary Data)

S: *Dr. Phelps, what time of day did you take the picture of the deserted town?* (Generating Primary Data)

S: *Dr. Phelps, if I were to look in a history book of this State, would I find any information about an epidemic in the area during the time this town existed* (Generating Secondary Data)

It's useful to learn to discriminate among original data generating, using primary data sources and using secondary data sources to gain insight into (1) the different kinds of data students are using, and (2) the range of data generating processes made possible by various inquiry problems.

STATING THEORY (ST)

> THEORY: An inference about relationships among data intended to serve as an explanation or solution for a problem.

In Stating a Theory the student reports what he/she believes to be a plausible solution or explanation for a specified inquiry problem. The theory stated may be one that was actually created by the student or one that was invented by someone else which the student feels makes sense. A theory may range from one or two words to a more lengthy statement. Theories may be presented in the form of a statement or a question. For example:

S: *I think the liquid goes to the other side because of the difference in temperature between the two sides.*

S: *I bet the people left because there was an avalanche.*

S: *It is because of the exports of the cities.*

S: *I think it goes because of pressure.*

S: *Does it go because of pressure?*

The following key words or phrases are useful in recognizing theories stated in a question form. Note that usually theories in a question form not only communicate the student's theory, but, also seek feedback about the validity of the theory.

Did you have to. . . . . .?

Does the. . . . . .work like. . . . . .?

Does. . . . . .have anything to do with . . . . . .?

Did. . . . . .affect the . . . . . .?

Was it caused by . . . . . .?

Was it necessary to . . . . . .?

Was . . . . . important?

It is agreed that the theories of scholars differ significantly from those of the student. Nonetheless, student's theories function for them in the same way as the scholar's theories serve the scholar. Thus, the rationale in identifying the student's solutions or explanations as theories is that the student will come to devleop an understanding of a theory as a tool of inquiry. In addition, students come to see theories as products of their own intellect as well.

For ease in classifying student behavior, student's judgments about their own theories or the theories of others are also coded as Stating Theory.

REPORTING DATA (RD)

Reporting Data occurs as a student reports (1) "I think" data, (2) "I need" data, or, (3) when he/she shares some "I have" data thought to be relevant to the problem. When a student reports "I think" or "I have" data, the data reported doesn't have to be valid in order to be classified as Reporting Data.

"I think" data:

S: *I think that's a deserted railroad track by the town.*

S: *That stuff sure looks like kool aid.*

"I need" data:

S: *I need to know if the railroad track is deserted.*

S: *I want to find out if that stuff inside the glass ball is kool aid.*

"I have" data:

S: *That railroad track by the town has been deserted for years.*

S: *That is methyl alcohol inside the glass ball.*

S: *When I put hot water on the glass part, I noticed the liquid went over to the other glass part very fast.*

On occasion, Reporting Data may occur in a negative way:

S: *That isn't kool aid in the glass ball.*

While in the case in which "it isn't" data is reported, the student may not know what the substance actually is, he or she does know what it isn't. That's data too.

REPORTING PREDICTION (RP)

In Reporting a Prediction a student forecasts data he or she feels will result from some proposed action. Reporting a Prediction includes forecasting data that is believed to exist at some time in the future, or it may be forecasting data that would be found if the inquirer would be able to go back in time. Whether forecasting future or past data, most predictions usually include two elements: (1) an action to be taken and (2) a forecasted outcome.

In some cases the action element of a prediction may not be stated per se, but is implicit in the prediction. For example, when a boy saw his friend coming toward him carrying an unusual looking kite, he said, "That won't fly." The implicit action element in this prediction is, "When you try to fly that kite, it won't fly."

S: *If the police come in there's going to be a riot.*

S: *If you put an ice cube on the empty side, the liquid will probably go over to that side.*

S: *I bet if I could talk to someone who lived then, they'd say that working conditions were terrible.*

S: *That pen won't write.* (Note: This statement is forecasting data. The meaning actually is, 'When you use that pen, it will not write.' This is significantly different from Reporting Data such as, 'The pen doesn't write,' or 'When I used it, the pen didn't write.')

STUDENT BEHAVIORS IN ACTION

When you observe students at work on an inquiry problem, they frequently make a statement or pose a question that can be classified as a series of different student behaviors.

For Example:

S: *The liquid moves to the other side only when you put your hand on it so it must be because of the heat.*

This may be viewed as two behaviors: *The liquid goes to the other side only when you put your hand on it,* may be classified as Reporting Data. The remainder, *so it must be because of the heat,* can be classified as Stating Theory. Thus, this complete statement would be classified as Reporting Data-Stating Theory.

On the other hand, classifying a student's statement or question into its component parts may become unmanageable and unnecessary in many situations. Instead, the teacher may prefer to consider only the main message communicated by the student. Because the student's main message in the example provided earlier is to communicate an explanation for the problem, it could be classified simply as Stating Theory.

Which way should student behavior be classified? The teacher must decide. In some situations listening for the main message alone will suffice. On other occasions, however, it may be important to attend to the various component parts of a student's behavior.

Dalstra Inquiry Teaching Strategy
Inservice Education Program

WHO DECIDES?

By

Ben B. Strasser, Co-Chairman

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Division of Curriculum and Instructional Services
Office of the Los Angeles County Superintendent of Schools

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WHO DECIDES?

In your classroom inquiry lessons, who makes and implements what we call the Inquirer Decisions? That is, who decides:

- what data should be gathered?
- how the data should be gathered?
- which are "good" data and which should be disregarded?
- how and when the data should be recorded?
- how and when the data should be organized?
- when the data available are sufficient?
- what inferences are drawn from the data?
- what the limitations of the data are?

Who decides:

- what theories are appropriate?
- how the usefulness of theories is appraised?
- what predictions or models are devised from a theory?
- what hypotheses are deduced from the theory under exploration?
- when a theory should be held as it is, or when it should be modified or disregarded?
- what the limitations of a theory are?

1 Adapted from an article by the author appearing in the May, 1971 edition of *The Science Teacher*.

Who decides:

- what theory-seeking strategies will be used?
- what theory-testing strategies will be used?
- which strategies are useful and which aren't?
- if and when the search is on a "wrong track"?
- when the search has been completed, for the moment, either because the initial problem has been answered and the problem is no longer a problem, or because the problem has been explored as far as the capabilities of the students at the time permits?

And, who decides on what bases these decisions will be made?

We tell ourselves, the children of our classes, their parents, and others, that regardless of what different content we teach, we're teaching children to think; that we're helping the children of our classes to continue to develop their powers to use their intellect and feelings in rational, orderly ways. When we turn to what actually happens in our classrooms, however, a discrepancy becomes very apparent. Curriculum guides decide about theories; textbook authors and the authors of a variety of other educational materials decide about experimenting and data; and we decide when the students are on the right track, the wrong track, and when the search has been completed. In few situations does the concern arise as to the bases for these decisions. She or he who decides is doing the thinking. What then is left for the students to do but to listen, follow directions, and remember the decisions of others at test time?

Of course, to face any student or class with the entire range of these kinds of decisions fundamental to inquiring and, at the same time, to consider the bases upon which these decision may be made, would probably be overwhelming to them. After all, they probably have not had much practice up to the time you face them with the task. But, the approach is no real mystery. It's called education.

We begin by confronting the students with some of the easier, more apparent problems at first. During the course of the semester, structure things so the students have many opportunities to face up to the entire range of "deciding" for themselves, one step at a time. And they should also carry out and evaluate the usefulness of the various decisions they make. That's called learning, provided the students consider and reconsider bases on which the decisions were made, the usefulness of the actions which resulted, and the consequences.

Is this what's going on in your classroom? Look reflectively at your text. Look closely at the films and supplemental materials you use. Listen to yourself as you talk to and with your class, or tape record some of your classroom dialogue for a more in-depth "listen." Then, in light of the questions posed at the onset of this paper, try to determine who makes these crucial decisions: the students or the teacher, the text, or the district curriculum guide.

Of course, the students probably shouldn't be in a position in which they are to decide everything about all of teaching. That would be to shirk our responsibility as teachers. If they are to learn something of what inquiry is all about, though, the students must frequently confront the range of questions suggested. To the degree that the learners face and deal with these and other such questions - to that degree is inquiry actually taking place for the learners.

In your classroom, who is really developing their rational/intellectual powers? Who decides?

PART II

THE INQUIRY GOAL - DIRECTED TEACHING BEHAVIORS

> A fundamental dilemma in facilitating the growth of students as inquirers is to do enough so they taste success, yet not so much that the success they feel is their teacher's success rather than their own.

No doubt, some students grow in their ability to inquire as a result of opportunities to inquire alone. Just giving these students a problem and the time to work is all that's necessary. For most students, however, the teacher has a more involved role. Some direct action must be taken to facilitate their growth.

In general, facilitating students' growth involves three kinds of thrusts. One of these thrusts is to help students initiate action to test their theories. Four teaching behaviors are used to provide this PROCESS SUPPORT for students. A second growth thrust is to help students become aware of the various inquiry process they or others use. This helps build the language of thought for students as they work to solve a problem. While only one teaching behavior is used to work toward this AWARENESS LEVEL, it has many variations which facilitate the student's awareness of data, theories, and the many inquiry processes utilized.

The third growth thrust is toward what is referred to as the FUNCTIONAL LEVEL. This helps students gain insight into what data, theories, and the various inquiry processes do for the inquirer. Like the Awareness Level teaching behavior, the Functional Level teaching behavior has several variations, depending on whether it is used with data, theory, or what data generating, data organizing, data using, or theory using process is highlighted.

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THE PROCESS SUPPORT TEACHING BEHAVIORS

Four teaching behaviors are used to help students begin testing their theories toward the time when they will do so on their own. Because these teaching behaviors are used developmentally, each providing help at a different level of sophistication, the group of four behaviors are called the PROCESS SUPPORT SEQUENCE. The teaching behaviors included are:

- PROBE FOR DATA (PD)
- PROBE FOR PROCESS/DATA SOURCE (PP/DS)
- SUGGESTING PROCESS/DATA SOURCE (SP/DS)
- DESIGNING PROCESS/DATA SOURCE (DP/DS)

Because of the newness of the lesson structure and the lesson climate established by the BASIC TEACHING BEHAVIORS, most students continue to participate in inquiry lessons even if they have no success in solving the problems they work on. Working on an inquiry problem in your own ways is it's own reward. However, for students to really experience the personal meaning and "glory" that comes from solving a problem, they must experience moving from problem to solution. To provide the support necessary – matched to the capabilities and needs of individual students – the Process Support Sequence of teaching behaviors is used.

The comments which follow outline the four Process Support Sequence teaching behaviors and the relationship among them. Used in response to a student's theory, the teaching behaviors toward the top of the list demand greater intellectual effort on the part of the student; little theory-testing help is provided by the teacher. Toward the bottom of the chart are those teaching behaviors through which more theory-testing help is provided by the teacher.

THE PROCESS SUPPORT SEQUENCE OF TEACHING BEHAVIORS

PROBE FOR DATA

A little support is provided as the teacher invites the student to think about the data he or she needs.

PROBE FOR PROCESS/ DATA SOURCE

Some support is provided as the teacher invites the student to think about what he or she will do to generate data necessary he or she needs. The use of this teaching behavior also lets the student know that his or her theory is testable.

SUGGESTING PROCESS/ DATA SOURCE

More support is provided as the teacher names some general inquiry process or data source the student may use to generate data necessary he or she needs.

DESIGNINC PROCESS/ DATA SOURCE

A lot of support is provided as the teacher actually designs a specific inquiry process in detail or specifies a data source the student may use to generate data necessary he or she needs. (The student must still implement the process or use the data source to generate that data needed).

A detailed discussion of each of the teaching behaviors of the Process Support Sequence follows.

PROBE FOR DATA (PD)

A first step in designing a test for a theory, explanation or solution is to determine what data is necessary to determine if the theory is a good one. For example, given the theory that people deserted a Colorado town because ore they were mining was depleted, information is needed about whether any ore deposits are still available in the immediate area. To help a student initiate some action to test the theory, the teacher invites him or her to give some thought to the data needed. The teaching behavior through which the teacher provides this help is called a Probe for Data.

S: *My theory is that the larger cities are decreasing in population because they are old and people move away from old, junky places. They stop going to junky stores, too.*

T: *What kind of data do you need to check that one out, Fritz?*

PROBE FOR PROCESS/DATA SOURCE (PP/DS)

With the data needed in mind, a second issue to which the inquirer must respond is what he can do or where he can go to generate that data. Or, some students who are unable to respond to a Probe for Data are frequently able to identify something they can do or a data source they can utilize to test their theory. The teaching behavior through which the teacher invites the student to consider what a student can do or where he can go to get data to test his theory is called a Probe for Process/Data Source.

S: *My theory is that the larger cities are decreasing in population because they are old and people move away from old, junky places. They stop going to junky stores, too. Most people like new places with air conditioning and all that stuff.*

T: *What might you do to test that theory, Fritz? Or, where might you go to get the data you need to test that theory, Fritz?*

SUGGESTING PROCESS/DATA SOURCE (SP/DS)

Another teaching behavior which provides somewhat more help for the student is called Suggesting Process/Data Source. The teacher does so by naming some process or data source the student might use to facilitate his or her work on the problem. The intent of the Suggesting Process/Data Source teaching behavior is to name one or more inquiry processes that the student may use, rather than to recommend an inquiry process the student is obliged to implement. The words a teacher uses in a Suggesting Process teaching behavior must deliberately communicate this intent. Frequently, therefore, phrases such as, "If you'd like to . . ." "If you want to . . ." "Perhaps you'd . . ." are included as part of this teaching behavior to assure the student clearly understands that it's up to him or her to decide whether to use or not to use the process suggested by the teacher.

While the Suggesting Process/Data Source teaching behavior is frequently used to help a student initiate action to test a theory, it may also be used effectively to help a student initiate some action to generate some data he or she has identified.

S: *I need to get some data about the general condition of the major cities we're working with: whether they're run down or not.*

T: *You can get that data by checking some of the books, pictures, or filmstrips we have in our reference center if you'd like.*

In addiiton to helping a student generate data, the Suggesting Process/Data Source teaching behavior is also used to alert a student to any of the other inquiry processes outlined in the Data-Theory Loop Model of Inquiry. For example:

TO SUGGEST A DATA ORGANIZING PROCESS

T: *You may want to try organizing your data in the form of a line graph to see if anything interesting shows up.*

TO SUGGEST A DATA—USING PROCESS

T: *With all of the data you have, you may want to study it to see if you can make any general statements about it or to look for any trends.*

TO SUGGEST A THEORY—USING PROCESS

T: *Perhaps you'd like to try making a model of your theory to see if you find out anything more about it.*

DESIGNING PROCESS/DATA SOURCE (PD/DS)

In using this Process Support Sequence teaching behavior, the teacher does most of the thinking for the student. In a sense, it's like taking the student by the hand, pointing out the "yellow brick road," and showing him how to take the first step. And some students need this kind of support—for their first time at least. The Designing Process/Data Source teaching behavior is used primarily with data generating or data organizing processes. In designing such processes for a student, the teacher outlines the process in specific detail so the student has only to follow the teacher's "directions" to implement it. It's critical to note that the student must decide whether or not he or she actually uses the process designed by the teacher.

S: *My theory is that the larger cities . . .*

T: *One thing you can do to find out whether the larger cities we're talking about are junky places or not might be to check the index of our reference book entitled, "Cities." Look for New York, Los Angeles, San Francisco and Chicago. There are various pictures of each of the cities there. Or, you could check our data bank picture file under "Cities" and look for pictures of New York. Or, you may want to check the filmstrip file in the school's resource center. Or, you may have some other ideas about how to check out your theory.*

The intent of the Designing Process/ Data Source teaching behaviors is to present one or more specific inquiry processes the student might use rather than to outline a specific inquiry process the student is obliged to implement. The words a teacher uses in the Designing Process/ Data Source teaching behavior must intentionally communicate this intent. Frequently, therefore, phrases such as, "If you'd like . . ." "If you want to . . ." "Perhaps you'd . . ." are included as part of the teaching behavior to assure that the student understands it's up to him or her to decide whether to use or not to use the process designed.

It's important to note that the Designing Process/ Data Source teaching behavior may serve two different kinds of functions for the student. First, and most obvious, it suggests a process the student may use or a data source that may be checked out. Another function of the Designing Process/ Data Source teaching behavior is to serve as a process model for the student. For example, when the teacher designs an experiment the student may use to test his or her theory, the teacher's effort may stimulate the student's thinking so he or she can design an original experiment.

While the Designing Process/ Data Source teaching behavior is most frequently used in response to a student who states a theory, it may also be used in response to a student who either reports data needed to test a theory or asks the teacher for data.

S: *I need to get some data about the general condition of the major cities we're working on; whether they're run down or not.*

T: *Elesia, you may be able to get that data by (1) checking the index of our reference book entitled, "Cities." Look for New York, Los Angeles, San Francisco and Chicago. There are various pictures of each of the cities there; or (2) you could check our data bank picture file under "Cities" and look for pictures of New York . . .*

T: *If you were to try plotting your data on a line graph, James, you may get some new ideas about what might be causing the problem at the town.*

USING THE PROCESS SUPPORT SEQUENCE

Before any of the Process Support Sequence of teaching behaviors are used, the teacher should have given the students an opportunity to test their theories on their own by using an Acknowledging teaching behavior. This teaching behavior provides some diagnostic information for the teacher about the present level of development of the students. For those students who do not begin testing their theories on their own over the course of *at least two or more* inquiry lessons, the teacher then begins to give help to these students by using the Process Support Sequence teaching behaviors.

To begin helping a student to test his or her theory, the teacher begins by first using a Probe for Data teaching behavior. If the student doesn't respond, the teacher may "drop down" a step and use a Probe for Process/ Data Source teaching behavior next time he or she states a theory. If that doesn't work, the teacher may use a Suggesting Process/ Data Source teaching behavior. And, if that doesn't work, the teacher may use a Designing Process/ Data Source teaching behavior next time the student states a theory. As this sequenced use of the teaching behaviors suggests, the Process Support teaching behaviors are normally used one at a time. That is, when a student doesn't respond to one of these teaching behaviors, the teacher should not repeat it or move down to a "lower" teaching behavior at that time. Rather, a Structuring teaching behavior is used to take the student "off the hook." Then, the "lower" teaching behavior is used at a later time.

After using any one of the Process Support teaching behaviors, the teacher makes certain that students understand it is up to them to take the action implied by the teaching behavior.

When one of the Process Support teaching behaviors is observed to have the intended effect on the student, that is, the student follows through and implements the process, the teacher moves up to a "higher" teaching behavior with that student next time some help is provided. For example, if the student responds to a Designing Process/ Data Source teaching behavior, next time the teacher will want to use a Suggesting Process/ Data Source teaching behavior for him or her. When a student responds to a Suggesting Process/ Data Source teaching behavior for that student next time. And so on.

STRUCTURING STUDENTS TO IMPLEMENT THE TEACHER'S PROCESS SUPPORT

Frequently, when teaching behaviors of the Process Support Sequence are first used, it is necessary to use a Structuring teaching behavior to inform the students that it is their role to implement the process or to utilize the data source. Note the effect of the Structuring teaching behavior in the following example. It serves to get the student to move from the design of an experiment to the implementation of that process to generate the data needed.

S: *I think squeezing that pulse glass thing is what makes the red liquid go.* (Stating Theory)

T: *What might you do to check that out, Millicent?* (Probe for Process/ Data Source)

T: *OK, that's something you can do if you want to.* (Probe for Process/ Data Source)

T: *I want to.* (Data Generating)

T: *Here's the pulse glass.* (Responding to Student's Data Generating)

All too often when the Structuring teaching behavior is not used, students identify data they need but never take action to get it. Or, they name or describe a process or data source but don't take action to implement or use it.

STUDENT RESPONSES TO THE PROCESS SUPPORT SEQUENCE

In discussing student responses to the Process Support Sequence of teaching behaviors, it's important to note three ways in which students may respond. First, a student may respond immediately. That is, the teacher may use a Probe for Process/ Data Source teaching behavior and the student responds by naming an inquiry process he or she will use and that process is desiged and implemented to get the data specified.

On the other hand, a response to one of the Process Support teaching behaviors may frequently take considerable thought. In these instances, a student's response may be what we call "latent." That is, the student will "pass" at the moment. Then, at some later time, the teacher will note that the student implements the process he or she discussed earlier. Thinking takes time. Complex thinking takes more time. So, the teacher shouldn't be anxious or frustrated if the student doesn't respond to one of the Process Support teaching behaviors a moment or two after the teaching behavior is used. And, of course, in addition to the immediate and latent responses, there may be no response by a student.

In summary, helping students move to test their theories is a matter of deliberate and thoughtful experimentation on the part of the teacher. Begin by giving no help. Use an Acknowledging teaching behavior to identify those students who are able to test their theories on their own. For those students who don't do so, provide increasingly more help for the students over a period of time until the teacher reaches the point at which the students take action to test their theories. Then, having taken action to test their theories, the teacher begins his move "back up" the Process Support Sequence of teaching behaviors toward the time when the students will be able to test their theories on their own. To do so takes listening to the students, analyzing what they're doing and remembering what they did last time. It's individualized instruction in its's highest form.

THE AWARENESS LEVEL TEACHING BEHAVIOR

Inquiring is more efficient if the inquirer knows what he's doing and does it on purpose.

A central thrust in learning to inquire is to help the student expand his or her repertoire of theory-seeking and theory-testing strategies. This goal isn't achieved, however, just because students are able to test their theories. A second kind of goal-directed action the teacher takes is to help the students become aware of the range of inquiry processes they use as they work. In addition, students must be able to differentiate between solutions, explanations, or theories and data.

The way the teacher works toward this goal is simply to label the various inquiry processes the students use, after they use them. The various inquiry products the students work with, data and theory, are labeled for the students in the same way. The teaching behavior used to help the students become aware of the inquiry processes and products is called, TUNING IN TO PROCESS PRODUCTS (TIP/P). Following are some examples of this teaching behavior.

T: *You've just generated some data by experimenting, Farquardt.*

T: *Cleora, you've organized your data by plotting it on a line graph.*

T: *As I watched you work so far, Grindstaff, it seems to me one strategy you used to find a theory is just to ask your friends what they think.*

T: *Dennis, you've built a model of your theory as a way of studying it more.*

Used with the group, the Tuning In To Process Product teaching behavior is a teacher intervention intended to help the group become aware of something going on among members of the group that may be affecting their work on the problem.

T: *You know, as I listen to what you're saying, it seems that all the group is doing is stating theories. Anyone care to comment?*

Inquirers must learn to discriminate between data and theory. To do so, the teacher simply labels the student's data and theories.

T: *Maylon, you have a theory about . . .*

T: *Gary, you have some new data about . . .*

THE FUNCTIONAL LEVEL TEACHING BEHAVIOR

> *The inquirer is more powerful who not only knows what inquiry processes are available to him, but who also knows what each process will do for him and what its limitations are.*

Having a repertoire of inquiry processes means more than being able to recall a list of specific Data Generating, Data Organizing, Data Using and Theory Using Processes. It also includes knowing when and under what circumstances each process is most effectively used. In the Inquiry Teaching Strategy, students learn when and under what circumstances each inquiry process is most effectively used from the "inside-out." That is, they learn by reflecting on how and/or why they used these various processes and what these processes did for them. The teaching behavior through which the teacher stimulates this reflective thinking is called PROBE FOR INTENT/FUNCTION (PI/F).

The Probe for Intent/Function teaching behavior is a "Why are you going to . . ." "Why did you . . ." "How did _____ help you?" kind of question. The purpose if to get the student to begin thinking about the power or limitations of an inquiry process he or she is about to use (intent) has used (function).

T: *Hensley, why are you planning to catalogue and tag all of the data you're collecting? How will that help you with the problem?* (Probe for Intent)

T: *Pat, how did putting several theories together to build your explanation help you?* (Probe for Function)

T: *How will experimenting help you test your theory, Dr. Zharkov?* (Probe for Intent)

T: *Judy, how does building a model of your theory, as you've done, help you understand it better?* (Probe for Function)

T: *Flash, how did the encyclopaedia help you in checking your earthquake theory?* (Probe for Function)

SUMMARY OF COMMON ERRORS IN USING THE INQUIRY GOAL DIRECTED TEACHING BEHAVIORS

Any of the Goal Directed Teaching Behaviors is used incorrectly when the teacher moves on to another teaching behavior without giving the student enough time to respond.

THE PROBE FOR DATA (PD) teaching behavior is used incorrectly when:

- The student has already identified the data he or she feels is necessary to test his theory.
- The teacher repeats the teacher behavior or otherwise "pushes" the student to respond.

THE PROBE FOR PROCESS/DATA SOURCE (PP/DS) teaching behavior is used incorrectly when:

- The student has already identified a process or data source he or she plans to use.
- The teacher repeats the teaching behavior or otherwise "pushes" the student to respond in a certain way.

THE SUGGESTING PROCESS/DATA SOURCE (SP/DS) teaching behavior is used incorrectly when:

- The student has already identified a process or a data source he or she plans to use.
- The teacher repeats the teaching behavior or otherwise "pushes" the student to implement his or her suggestion.

THE DESIGNING PROCESS/DATA SOURCE (DP/DS teaching behavior is used incorrectly when:

- The student has already designed a process or specified a data source he or she plans to use.
- The teacher "pushes" the student to implement his or her suggestion.

THE TUNING IN TO PROCESS/PRODUCT (TIP/P) teaching behavior is used incorrectly when:

- The teacher identifies the student's inquiry process or inquiry product incorrectly.
- The teacher identifies the student's inquiry process or inquiry product incorrectly.
- The teacher identifies the student's inquiry process or product for him when he is already aware of the process he used or the product he produced.

THE PROBE FOR INTENT/FUNCTION (PI/F) teaching behavior is used incorrectly when:

- The teacher is not relatively certain the teacher is aware of his reason for using the particular process he used. Thus, the net effect is to teach the student he doesn't know what he's doing: "See there, dummy."

Dalstra Inquiry Teaching Strategies
Inservice Education Program

DATA, DATA BANKS, AND LEARNING OPPORTUNITIES FOR STUDENTS

By

Ben B. Strasser

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ORIGINAL, PRIMARY & SECONDARY DATA

As you work to solve a problem you may find yourself observing, experimenting, interviewing people, and so on. In other words, you would be forming your own descriptive statements about your environment. You'd be working with what we'll call original data.

You'll decide what data to look for, what data is good and what isn't, what data to keep and what to disregard, how the data will be recorded, organized, and so on. But then it's not always possible, practical, or advisable to generate your own data – first hand.

If the fellow down the street - or anyone for that matter - does some observing, experimenting, and so on in working to solve a problem, he's involved in generating some data. If you began work on a similar problem you'd probably go to him and ask to look at his records - at the data he generated. In so doing you'd be using primary data. That is, you'd be looking at and using the data as recorded, by someone else. However, it is data that was generated, recorded, and organized by someone else in terms of what they know, based on their value system for their purposes. And it's one step removed from the real world.

On the other hand, you may not know a person to go to who is working on a problem similar to the one you're working on. Then you'd probably check periodicals, books, etc. to find some reports of research (inquiry) in the area. In this case you'd be reading a paper one fellow has written about the work of other people. You'd be using secondary data.

In these instances the data has usually been rethought, restated, and reorganized by yet someone else. One more step removed from the real world. But then, primary data isn't always available. And generally secondary data is much more accessible.

A DATA BANK

A data bank is an assembled set of primary and secondary data designed to respond to a range of theories even remotely relevant to a given problem situation. It includes data irrelevant to the problem as well as those data students working on the problem will probably need. One data bank may include materials for more than one problem situation.

Data Bank Materials.

The data should be available in as "raw" a state as possible. Emphasis should be on other-than-text materials, including charts, graphs, pictures, maps, short written records, filmstrips, film lists, and so forth. The data bank may also include a reference to related data available in other locations. For example, "See also **World Book Encyclopedia,** Vol. III, pp. 183—195. See the filmstrip entitled, 'Molecules in Motion,' etc."

Uses of Data Banks

Data banks may be designed for use by the teacher, for those lessons in which she or he makes data available to individual students as they request it. Or a data bank may be designed for use by individual or small groups of students. In this latter case, multiple copies of the materials should be included. Thus, on the one hand, a data bank may be a slip of paper jammed full of notes, a notebook, or a box of "stuff" the teacher uses. On the other hand it may be a box or suitcase of books, pictures, slides, charts, and so on organized so students will be able to use them.

Not All Problems Need A Prepared Classroom Data Bank

In this brief discussion about data banks it's important to note that not all problem situations suitable for classroom inquiry must have a prepared data bank. For example, in one instance the teacher may not have a prepared data bank because he wants the students to interact directly with their environment—in their own ways—to generate the data needed.*

With other kinds of problem situations the data students will need may be such that a prepared data bank is not appropriate. In mathematical inquiry for example, the students generate their own data as they experiment with numbers, symbols, etc. In the historical the "Write the history of the playground yesterday. You were all there," kind of problem, the student's data bank is the schoolground: the students, teachers, schedules, people who live adjacent to the school, the playground areas, their own experiences. In inquiring to find ways to build depth into a class mural to make it look more "real," the data the students need are generated through their observations of their environment, pictures in magazines and books. They also generate data as they experiment by cutting and pasting and by using crayons, paint, or what-have-you. In inquiring to solve social problems which emerge among students in the class, the students are their own data bank.

DIFFERENT KINDS OF DATA CALL FOR DIFFERENT SKILLS

In interacting with their natural and social environment to generate their own data, students are confronted with a range of difficult and complex decisions. For example, of the infinite set of data available for almost any problem situation, the students must decide, "What data shall I attend to and what data can I forget?" Then, their efforts center on producing the data accurately, recording it, organizing it, and so on. Making and implementing these decisions call for one specific set of skills.

Using primary and secondary data however, raises a different set of issues with which the students must deal. Questions of validity, accuracy, and specificity are always a concern. But no matter how primary and secondary data are made available, they represent the purposes and values of the individual who performed the original data generating operation. Issues which emerge for the inquirer in these instances therefore center on "psyching out" the purposes and values of the individual who generated the data. For example, what other data was available but not reported? What techniques were used to generate the data? Why was this data sought and not other data which was probably available? Of many alternative ways of recording and organizing data, one way was selected. And the way data is recorded and organized tells one story rather than another.

What were the inquirer's motives in recording and organizing the data the way he did? How might his motives have influenced the data he reported? To respond to these issues demands other kinds of skills of the inquirer.

While generating original data and working with primary and secondary data call for many of the same skills, each makes unique demands on the inquirer. This suggests that to maximize students' opportunities to learn to inquire, they should work on problems for which original data is used as well as those problems for which only primary and secondary data are available.

Teaching Toward Inquiry
Inservice Eduation Program

THE REAL WORLD AS A DATA BANK

Involving Students in the Development of Data Banks for Classroom Inquiry

by

Gus T. Dalis, Consultant

Office of the Los Angeles County Superintendent of Schools

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THE REAL WORLD AS A DATA BANK

Many agree that learning how to inquire is both a goal for education and a set of objectives for classroom instruction. There is also general agreement that teachers should provide opportunities for youngsters to learn how to inquire in the schools. That is, that this opportunity should be provided for all youngsters in the elementary, junior and senior high school levels in all subject matter areas.

At this point, however, a crucial dialogue begins. It usually goes something like this, "It's fine to say that we want inquiry in the classroom, but where will we get the data banks? Without data, inquiry can't take place. Who will develop the data banks we need? (Though not all inquiry problems need prepared data banks.) Where will they come from? All teachers are busy enough now. It takes time to determine what data is needed, to get it, and organize it in some useful way. Yes, inquiry is important, but there just isn't enough time to do all of the things teachers have to do now without worrying about collecting all of the data bank materials necessary for a semester's problem situations."

Generally, dialogues such as these end with the conclusion that the only way inquiry teaching is going to work is if some ready-made data banks are made available. But a selection of ready-made data banks suitable for a given curriculum is not available at present. No data banks no inquiry?

TEACHER DEVELOPED DATA BANKS

There are problem situations for which only minimal time is necessary to assemble the beginnings of a data bank; enough to get the class and problem going strong. (Data banks are never complete. There is always some data a student will need to test his/her theory which should be added. Or, new data will be encountered which should be included.) Suppose, for example, that a problem has been identified such as, "Why do 43% of all adults 17 and over smoke cigarettes even though smoking is dangerous to health?" There are sources of data readily available such as the Surgeon General's Report on Smoking and Health, articles from medical journals, and data from several studies made available by the National Clearinghouse on Smoking and Health.

Textbooks, filmstrips, articles, films, and people serve as useful data sources for many problem situations drawn from different areas of the curriculum. But what about those problem situations which arise spontaneously in the classroom or those for which data are not as readily available? Involve the students! Give them the opportunity to generate data first-hand from the environment.

STUDENT DEVELOPED DATA BANKS

Phase I. Beginning Work on a problem

Problem situations for which no data bank is available may be initiated in the same way other problem situations are introduced. That is, the teacher creates the problem setting and poses the problem quesion. The problem question may be one the teacher or a student has identified. Then the teacher outlines the structure for the lesson. In structuring for this kind of inquiry activity, the teacher will want to inform the students that only very limited data is available in the classroom for this problem; that they'll have to generate most of their own data; that class time will be allotted for the gathering of data. The teacher, however, will provide data that students ask for to the degree that she/he possesses such data.

With the problem stated, the students may begin doing several things. They may state their theories and report data they need as they begin work in search of a theory or as they design ways to test their theories. Whenever the students report data they feel they need, and the teacher does not have it available, she/he makes note of the data needed on the chalkboard or on a transparency. This list may be titled "Data Needed."It is recommended that the chalkboard or a transparency be used so that the list is visible and public.

Phase II. Individual/Group Data Generating Activity

When the students "run dry," either because they've done all they can with their theories without having any data available or because they've listed all the data they need at the time, the lesson moves into the second phase. That is not to say that inquiry on the problem stops. It

only means that the group's thinking shifts from work on the problem per se, to planning ways they can generate the data they need. This is initiated with a PROBE FOR PROCESS/DATA SOURCE teaching behavior, such as: "How can you go about getting the data?" The discussion which follows becomes a basis for students extending the search for data beyond the classroom walls.

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When the next inquiry activity is scheduled, time is set aside for students to report the data they generated. Some of the class discussion may also center on reviewing difficulties the students had in getting their data. Students' concerns about the validity of the data reported may also arise.

The data secured by individual students is made a matter of record for all of the students. The data then becomes a part of the growing data bank for this particular problem. Those instances in which the students are unable to generate data poses a new set of difficulties: "No data? What now?" "How does one proceed to build or test a theory, explanation or solution when it seems that the data needed is inaccessible?"

With continuing work on the problem, the data generating activity may be repeated. Hopefully, however, in future instances this activity will be organized more by the students and involve the teacher less. Actually, the listing of data needed and the assignment of class time to generate it may be repeated several times as work on the problem continues, depending both on the students' continuing data needs and their interest in the problem.

As a consequence of the students' search for data, the problem data bank begins to grow. Next time – with the next class – a classroom data bank will be available for this problem situation. A data bank for a new problem may be developed in similar ways by the new class.

By involving students in developing a classroom data bank the teacher utilizes student interest and manpower to generate data. As a result, the students grow in their ability to interact more productively with the real world. They are able to move beyond the kinds of learnings which are open to them when their inquiry is limited to problems where pre-packaged data is provided. While data assembled and organized for easy access and written to students' reading level may facilitate inquiry, the real world of data just isn't like that!

Certainly these kinds of inquiry activities take somewhat more time, and tend to be somewhat slower moving than those problems for which a prepared data bank is available. Because of this and because first time inquirers usually respond better in fast moving lessons, it is generally recommended that first inquiry activities have prepared data banks available. However, these "data bank" problem situations should soon be coupled with opportunities for students to move out into their extra classroom environment to generate data for themselves.

Moving out into the extra classroom environment to generate data is important for at least three reasons. First, it's one valid way of extending the range of potential problems suitable for classroom inquiry beyond those for which a prepared data bank is available. Second it makes it possible for the class to work on problem situations identified by members of the class.

And third, in moving beyond a previously prepared classroom data bank to generate data, the students have opportunities to develop certain data generating and data validating skills not necessary in using a pre-packaged classroom data bank. Actually, these are the moments at which the inquiry of a school child begins to unfold as the inquiry of the scholar.

Teaching Toward Inquiry
Inservice Eduation Program

THE REAL WORLD AS A DATA BANK

Involving Students in the Development of Data Banks for Classroom Inquiry

by

Gus T. Dalis, Consultant

Office of the Los Angeles County Superintendent of Schools

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THE REAL WORLD AS A DATA BANK

Many agree that learning how to inquire is both a goal for education and a set of objectives for classroom instruction. There is also general agreement that teachers should provide opportunities for youngsters to learn how to inquire in the schools. That is, that this opportunity should be provided for all youngsters in the elementary, junior and senior high school levels in all subject matter areas.

At this point, however, a crucial dialogue begins. It usually goes something like this, "It's fine to say that we want inquiry in the classroom, but where will we get the data banks? Without data, inquiry can't take place. Who will develop the data banks we need? (Though not all inquiry problems need prepared data banks.) Where will they come from? All teachers are busy enough now. It takes time to determine what data is needed, to get it, and organize it in some use ul way. Yes, inquiry is important, but there just isn't enough time to do all of the things teachers have to do now without worrying about collecting all of the data bank materials necessary for a semester's problem situations."

Generally, dialogues such as these end with the conclusion that the only way inquiry teaching is going to work is if some ready-made data banks are made available. But a selection of ready-made data banks suitable for a given curriculum is not available at present. No data banks no inquiry?

TEACHER DEVELOPED DATA BANKS

There are problem situations for which only minimal time is necessary to assemble the beginnings of a data bank; enough to get the class and problem going strong. (Data banks are never complete. There is always some data a student will need to test his her theory which should be added. Or, new data will be encountered which should be included.) Suppose, for example, that a problem has been identified such as, "Why do 43% of all adults 17 and over smoke cigarettes even though smoking is dangerous to health?" There are sources of data readily available such as the Surgeon General's Report on Smoking and Health, articles from medical journals, and data from several studies made available by the National Clearinghouse on Smoking and Health.

Textbooks, filmstrips, articles, films, and people serve as useful data sources for many problem situations drawn from different areas of the curriculum. But what about those problem situations which arise spontaneously in the classroom or those for which data are not as readily available? Involve the students! Give them the opportunity to generate data first-hand from the environment.

STUDENT DEVELOPED DATA BANKS

Phase I. Beginning Work on a problem

Problem situations for which no data bank is available may be initiated in the same way other problem situations are introduced. That is, the teacher creates the problem setting and poses the problem quesion. The problem question may be one the teacher or a student has identified. Then the teacher outlines the structure for the lesson. In structuring for this kind of inquiry activity, the teacher will want to inform the students that only very limited data is available in the classroom for this problem; that they'll have to generate most of their own data; that class time will be allotted for the gathering of data. The teacher, however, will provide data that students ask for to the degree that she/he possesses such data.

With the problem stated, the students may begin doing several things. They may state their theories and report data they need as they begin work in search of a theory or as they design ways to test their theories. Whenever the students report data they feel they need, and the teacher does not have it available, she/he makes note of the data needed on the chalkboard or on a transparency. This list may be titled "Data Needed."It is recommended that the chalkboard or a transparency be used so that the list is visible and public.

Phase II: Individual Group Data Generating Activity

When the students "run dry," either because they've done all they can with their theories without having any data available or because they've listed all the data they need at the time, the lesson moves into the second phase. That is not to say that inquiry on the problem stops. It

only means that the group's thinking shifts from work on the problem per se, to planning ways they can generate the data they need. This is initiated with a PROBE FOR PROCESS/DATA SOURCE teaching behavior, such as: "How can you go about getting the data?" The discussion which follows becomes a basis for students extending the search for data beyond the classroom walls.

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HIGH SCHOOL 1944

A Problem for Historical Inquiry

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HISTORICAL INQUIRY AND HISTORY LESSONS, ONE VIEW

The search for problem situations effective in stimulating historical inquiry in the classroom continues to challenge the thought, imagination, and energy of many teachers. At first glance suitable problems seem easy to identify. How about, "What were the underlying causes of the Civil War? Why Watergate?" And on and on. Easy.

When these kinds of problems are usually given to students, though, what goes on behind classroom doors isn't historical inquiry for the students.* Why not? Consider a few of the more obvious activities of the historian as compared to what students usually do as they are involved in such "history lessons."

Students involved in history lessons generally:	*The historian involved in historical inquiry:*
Use secondary data sources, essentially the textbook or other materials as provided by the teacher.	Generates his/her own data and also uses primary data sources.
Use data which is pre-selected, pre-screened for validity, pre-digested, and pre-organized. He/she has only to read, recall, and recite.	Decides for himself/herself what is data, which data are relevant, and how he will go about generating it, organizing it, and so on.
Make judgments about the validity of the history he/she recalls based on how well what he/she says compares to what the text says, and, whether the teacher accepts it or not.	Makes judgments about the validity of the history he/she writes based on the data available and how his/her history interfaces with related works.
Deal with the quesion of validity of data only in those instances in which some text materials disagree. In these cases it is usually the data from the book which has the latest copyright that is assumed to have the greater validity.	Is continually alert to the question of the validity of the data with which she/he works, especially in relation to her/his own data generating activities.
Come to know only the history which historical inquirers have developed earlier.	Not only builds the history, but also (1) makes decisions about how he/she will write it, and (2) puts his/her "history" in writing in a way which will communicate what he/she wants to communicate.

*For a comprehensive discussion of inquiry, see TEACHING TOWARD INQUIRY, Chapter 2, The Data-Theory Loop Model of Inquiry, Strasser, et. al. National Education Association, 1971.

To the degree that students find their classroom activities limited to those specified in the left column, we conclude that they're not involved in what we call historical inquiry. They're not working toward the developement of their abilities as inquirers.

Perhaps it's important at this point to underscore the observation that a prime goal for most history classes centers on teaching the students specified historical data. *We have no quarrel with this goal.* Nor do we take any issue with teachers who give their students assigned readings, show films, and so on, in order to get the valued facts from the text into the minds of students. *Our point is that doing such things is not teaching toward inquiry.* If, however, the goals for the history classes also include developing the students' abilities as inquirers within the arena of history, and if the teacher is concerned with developing the students' understanding of how history is written, then inquiry teaching strategies should probably be a part of what goes on in these classrooms as well.

The task of involving students in historical inquiry centers on shifting the work of the students from the more "usual" activities of history classes which are indicated in the left column to those outlined in the right column. How does that happen? What does such a lesson look like? Read on!

What follows is a sketch of a lesson which, in our view, is historical inquiry. It is adapted from a lesson created and taught by John Chick, a teacher at Downey High School and a member of the Downey Inquiry Leadership Team. The emphasis of the students' work is on generating original data. This is not because to do so is a game they're playing, but because it's the only way their work on the problem can progress. No written or prepared materials on the topic exist to which the students can turn. It is necessary therefore for them to build their own data bank. To do so they have to turn to the real world. They identify and review people, check pictures and other kinds of records, organize and synthesize their data, and communicate their history to others. That's what historical inquiry is all about.

Students As Historical Inquirers

Ms. Penelope Parkenfarker is a high school history teacher. One of the areas of study she works with is the Second World War. As a way of stimulating the students' interest in the topic, she identified a problem question which seemed to be relevant to the students: WHAT WAS LIFE LIKE AS A STUDENT IN THIS HIGH SCHOOL IN 1944?

The students responded quickly. "Well, way back then they . . ."Ms. Parkenfarker recorded all of their comments on the chalkboard as quickly as they came. When one student disagreed with what another student had reported, she put a check by the first student's comments to indicate that there was a question from someone else in the group about it. (This technique prevented arguments about what was right or wrong—and yet made public note that the validity of the data or ideas reported was challenged).

As the dialogue continued, the comments of one student triggered the thinking of other students. It wasn't long before the chalkboard was covered with comments. Several had challenge marks.

When the students ran out of information, Ms. Parkenfarker invited them to review the data and ideas listed on the chalkboard. After a few minutes of reading time she asked, "What does what we have on the board tell you about the life of students in this high school in 1944?

Some of the students responded by just reading some of the statements aloud. "Food was rationed so you couldn't eat anything you wanted unless you could find a place that had the food and you had the right food stamps — or whatever you had to have to be allowed to buy it. I'll bet lots of kids ate in the school cafeteria so their folks wouldn't use up their food stamps." Some of the students reported a synthesis of several of the ideas and data recorded on the chalkboard.

HIGH SCHOOL 1944

Starting The Lesson

After all of the students had an opportunity to respond, Ms. Parkenfarker said, "What's the difference between the kinds of things we have listed on the board and what we might call the history of the students of this high school in 1944?" They responded by commenting that the statements on the board were just unrelated bits, some of which might be incorrect. "A history takes lots of bits like these — all of which are checked out as much as possible to make certain they're O.K. — and ties all of them together so they make some kind of sense. In that way you can see how one bit is related to another one and how one thing might be caused by another. You get a picture of the whole thing."

Then Ms. Parkenfarker posed the crucial question, "With this start, what I'd like to invite you to do is to write your own history of the life of students of this high school in 1944. We'll concentrate only on what went on here at school. Recognize though, that what goes on here at school is certainly affected by other things that happen in the Community, the State, and in the Country. What do you think, does that make sense?"

To structure the lesson she went on with, "As you get going you can work alone or in teams. The size of your group depends on you. And you won't have to put your history down in writing like the kinds of reports we usually do for some of the other things we work on. Your job will be to find a way to communicate your history to others. How you choose to do it depends on you. Any ideas?"

The discussion which followed helped reveal some possibilities. Ms. Parkenfarker stressed the notion that they might communicate their histories in many ways. Of course, reports would be O.K. They could make an oral presentation or participate in a panel. The only constraints she placed on how they would communicate their "history" was that it must be possible for all of the students in the class to read it or listen to it.

Because of earlier discussions about whether or not several of the statements listed on the board were correct or not, some students raised a question about how they would go about getting the information they would need. One student commented that their textbooks didn't have information about the lives of the students of their high school!

To this observation Ms. Parkenfarker responded with, "Yes, that's real concern. Getting data is one of the kinds of things historians must deal with. Where will you get the data you need?"

For awhile there was silence; the sound of thinking. Then a few ideas came. And a few more. And more. The class was caught. They were off and running. Now Ms. Parkenfarker had only to make it possible for the students to get to work.

As the work on the problem began the teacher decided that the students would use one class period a week as their "in class" working time. A total of eight such class periods would be allocated. She also informed the students that they may also find themselves using some out-of-class time as well.

Work Begins

Some of the students got started by checking copies of old school annuals and school newspapers they found in a corner of the school library. Some checked libraries for articles in local newspapers aobut their high school or about high school students' activities. Other students came up with the idea of checking with the school district personnel office to find out if anyone presently employed by the district was employed in 1944, including teachers, administrators, custodians, bus drivers, warehouse workers, and so on.

Three people were found. They agreed to be interviewed by some of the students about what they did and about what they knew of the lives of students then.

As reports came in about the interviews, someone in the class suggested that they try to find people in the community who were students at the high school in 1944. Some must still live in the area. And they might agree to be interviewed.

To find the names of students of the high school in 1944, the students scanned the 1944, 1945, and 1946 yearbooks. (The 1945 graduates were juniors in 1944, and the 1946 class were sophomores in 1944). They turned to the local telephone directory to set up interviews. Because of school policies, interivews had to be scheduled at the school. So, the number of people they found able to come into the school during the school hours to be interviewed was limited.

From their earlier interviews with the people who worked at the school in 1944, the students had learned that interview questions should be planned if they are to yield the data they need. So interview questions were discussed and what they wanted to listen for in the response was outlined. The students also discussed how they might determine when people were talking to "make themselves feel good" and when they were reporting "real data."

In looking through the school yearbooks to identify potential interviewees, one student commented that the pictures were also good data; the pictures revealed some of the kinds of things the students did at that time. One of the students who was also taking a class in the print shop suggested that there might be some pictures in the files that weren't used in the 1944 annual or school newspaper. These would be useful too.

This idea mushroomed into a survey of various school departments. The print shop had some copies of the announcements, fliers, and other materials they produced in 1944. The music, English, art, athletic, and science departments all had some momentos of the past which were data useful to the student historians.

Other students turned to records of meetings of the school trustees in search of any decisions or actions which might have had some influence on the life of the high school students then. School course offerings and schedules were examined. Requirements for various courses were reviewed. Pictures of the high school in 1944 and a look at the original architectural plans also

revealed some new data. "There were not student parking lots. Didn't the students have cars then? How did they get around? Did the school bus all of the kids? How about the gas shortage; could the parents have driven them to and from school?" And on and on. New data stimulated new questions which, in turn, stimulated the search for new data sources. Even some of the interviewees were revisited and invited to respond to some new questions.

Writing Their Histories

With the data they had generated, the students began formulating their histories of what it was like to be a student at the high school in 1944. As this part of the activity got going, the students began to explore different ways histories may be written. Now they looked at their text and other written materials, but with a different question in mind than the author had intended. They were looking to study the way the author set about to tell the history.

Some students wrote their history as a diary of the life of an imaginary 1944 student. One student wrote up one year in the life of one of the 1944 students he interviewed as a kind of biography. A few students used a comic book format to communicate their view of what life was like for students "way back then."

Some students used copies of old pictures and played parts of their tape-recorded interviews for their presentation. To these, they added their spontaneous comments. One group of students developed a "Your Were There" dramatization while another team did what they called, "The Life of a 44er." Another group did a "Channel 7 Newscast Special."

Not all of the histories were as imaginative as the few mentioned. Many students chose to prepare their histories as more typical reports. Even these varied in treatment, however. Some reported notable events chronologically throughout the school year. Some dealt with the major concerns of the students of 1944 which they uncovered or inferred from their data. Some of the histories centered on a central theme such as social activities, clothing, transportation, school events, and so on.

The Process Dialogue

Occasionally as work progressed the teacher called the class together to discuss how their work was going. Problems were raised by individual students to which the entire class responded.

And, during this discussion the teacher also posed questions such as those which follow to stimulate the student's thinking.

> How do you go about building your history? Where do you begin?
>
> How do you go about getting the data you need?
>
> How do you decide what data to look for?
>
> When you use interviewing as a way of generating data, how do you know, which questions to ask? How do you decide when people are "talking to make themselves feel good" and when they're reporting good data? And how do you know what to listen for?
>
> What are some of the various data sources you found as you worked? Which were most helpful to you? How do you decide what data won't be included in your history?

What did you do if you found that some data you got conflicted with other data? How did you deal with that? How did you organize the data you got? How did you decide on a way to organize it?

How do you decide what to look for and keep when you checked the newspapers, annuals, and such?

How did you decide on a theme for your history?

How do you know if your history is accurate?

How do you know if you are communicating what you think you're communicating through your history?

How might you go about this differently the next time you work in this way?

Historical Inquiry, Some Final Thoughts

This lesson was successful as historical inquiry because it included (1) a highly motivating problem question the students could solve by generating their own data, (2) a teaching strategy that made it necessary for students to decide for themselves how they would work and whether their theories were "good" or not, and (3) appropriate "process dialogue" questions such as those cited earlier to stimulate the student's reflective thinking about the various inquiry processes and strategies they used. As a result, the students began to develop a knowledge of the era of the Second World War, they sharpened their abilities as inquirers within the context of historical problems, and the students, got a "feel" for what historical inquiry is all about. Because of their experiences these students are more likely to understand how the history they find in their texts came to be written, and are far more able to make critical judgments about what they find there.

We call this lesson "historical inquiry," because students had an opportunity to come to grips with the same kinds of issues historians respond to as they inquire. Certainly, **High School 1944** will not be a problem situation suitable for all students, especially elementary, junior, or high school classes in schools built a year or so ago. The idea is nonetheless applicable to any teaching situation. For example, a class of third graders studying their community can build the history of a part of their community at some earlier period of time. A class of fourth graders may write the history of the life of students at their school the year the school opened. Regardless of what the specific problem task is, however, the thrust is to invite the students to use the real world as a data bank* as they work to build the history of a part of their lives.**

*THE REAL WORLD AS A DATA BANK, Gus T. Dalis, Teaching Strategies Center, Division of Curriculum and Instructional Services, Office of the Los Angeles County Superintendent of Schools.

**See also, "The History of the Playground Yesterday, You Were There," SOCIAL STUDY, INQUIRY IN ELEMENTARY CLASSROOMS, Millard H. Clements, et al. Bobbs-Merrill, 1966, p. 224-228

Dalstra Inquiry Teaching Strategies
Inservice Education Program

TOWARD INQUIRY IN COMMUNICATION

by

Gus T. Dalis and Ben B. Strasser

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TOWARD INQUIRY IN COMMUNICATION

by

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Historically teachers have involved children in writing original stories, developing filmstrips, making television programs, giving oral reports, writing plays, and so on. Usually these and other related activities are viewed as language arts lessons. And rightly so, because the emphasis of instruction is primarily on developing the student's abilities to use language. When their work is completed the students usually get some helpful reactions from their teacher or their peers about words that may have been used incorrectly, spelling, and so on. In some instances they may also get reactions to their story per se: the setting, the characters, how the story began, how it developed, how it ended and so on. However, while children's ability to use language is certainly fundamental in most communication and is an important goal of education in itself, exercises such as these are seldom inquiry in communication for students.

Inquiry in communication begins with an idea, experience, data, a feeling, an attitude, or a value one person wants to communicate to others. It involves deciding what is to be communicated at both the cognitive and affective levels.

It involves deciding how to go about getting the message to your audience—how you will tell your story. It involves building the communication, including the hard creative and critical thinking that moves the germ of an idea to a product. It involves checking out the communication to find out if the audience got the message you wanted them to get. Finally, it may also involve revising the communication to do a better job, and taking action to check it out again.

Obviously, inquiry in communication is a complex and intellectually demanding process when compared with a more usual language arts lesson. The objectives are different. For example, in a language arts lesson we have had fourth grade students write stories as stimulated by some of Norman Rockwell's pictures from the covers of the old "Saturday Evening Post" magazines. The stories usually took a language arts period or so to write. After the student's work was collected, the teacher would read through stories to identify spelling, work usage, or grammatical errors. Students then corrected these errors and recopied their stories. Then some children were invited to read their stories to the class. Some stories ended up on the bulletin board under the caption, "Our Best Work," or they may have been included in a class book of some sort. Seldom can we recall ourselves or other teachers even asking students to report the idea, feeling, attitude, position or opinion they were trying to communicate in their stories, nor did we make it possible for the students to design and implement some ways to find out — for themselves — they did a good job. It was always the teacher who told them if they did a good job by writing an "A, B, C, or D" on their work.

In using these same magazine cover pictures as the focus for an inquiry in communication lesson, some significant differences are readily apparent. Rather than stressing work usage alone, the explicit emphasis of instruction is on getting students involved in trying to communicate with a group. For example, once having seen a particular Norman Rockwell picture, the students might engage in some dialogue about how they feel about it; what they'd like to communicate about it; what their message about it might be; how they'd like to make others feel. They would probably also spend some time in brainstorming how they'd go about communicating their ideas or feelings. This whole process might take place as students work alone or in groups. They should have adequate class time scheduled for work; perhaps two, three, or more class-periods. Creating a communication to a group takes more time than just writing a story. But then the students are learning more as well.

Obviously, some students would write their stories. But written communications are to be read by others, not read to them. So opportunities must be made for the students to have their stories read by other students.

However, writing a story can be more than figuring out what words are to be used. In communication there is no rule that says each or every page should be written on margin to margin, single spaced, or even from top to bottom. Any approach is good if it accomplishes what the author wants it to accomplish. The students can experiment with different styles of printing or writing using press-type (the kind you rub onto paper, which is available at local artist supply or stationary stores) or by cutting letters, words, or sentences out of the newspaper, or by laying out words on the page in different ways, and so on. Each different approach influences the message received by the reader differently. What's that they say about a medium and the message? And the more there is to experiment with, the more interesting, challenging, and fun the work is and the greater the learning potential for the students.

But the student's work shouldn't necessarily be limited to writing of some sort. The purpose in communicating is to communicate, using whatever means is effective. Some children may want to prepare an audio tape recorded presentation. They can experiment with pacing, sound effects, using different voices, showing slides or pictures, and so on. Some may choose to make oral presentations or use the overhead projector with some prepared transparencies. Some may want to use poems, paintings, music, songs, and so on to communicate their feelings or concerns.

Outlined in greater detail, an inquiry in communication provides opportunities for students to

FORMULATE THEIR MESSAGE: Working to specify both the cognitive and affective dimensions of what they want to say.

DETERMINE THE MEANS THEY WILL USE: Deciding who is to receive their communication, what media will be used, the setting in which the communication takes place, and so on.

CREATE THE COMMUNICATION: Finding or creating the words, pictures, sounds, and symbols to be used, the sequencing and pacing, and so on.

CHECK OUT THE COMMUNICATION: Actually using the communication with others and formulating and using some way of finding out what message was received, how the people felt about it, and theorizing about the limitations of the communication identified.

REVISE THE COMMUNICATION: Modifying the media/means, the setting which the communication takes place, the words, pictures, sounds, symbols, pacing, intensity, etc., in order to make the message received more consistent with the message intended, or modifying the actual message intended.

The "Formulating, Deciding, and Creating" stages in the development of a communication always take place in view of the critical question, "How will we check out what we've done?" To do so, some "authors" may decide to interview students who elected to read their story (What questions will they ask?). Some students may design a brief survey form to be completed by the class. Some students may elect to go through their communication part by part with their audience to get specific reactions about the various elements of their work. Some students may elect to get only "total message" reaction. Some may elect to get both.

Concerns about getting helpful reactions may give rise to some student-initiated skill building lessons which center on various ways they might go about it. This class might also discuss and role play how they can give helpful reactions to others when they are invited to do so, rather than reporting value judgments about their work alone. After they have gotten reactions we'd see some students going back over their communication and revising it; changing the words and music, pacing, and so on, and then finding students from other classrooms, teachers, members of the PTA, parents of children in the class, or others to try out their communication again to find if it's doing a better job. And finally, we'd see the students spending some time involved in a group dialogue with the teachers discussing ways they worked; recounting various inquiry processes and strategies they used both in creating their work and in testing it out.

It should be noted that throughout these kinds of activities students learn in various ways. They learn as they formulate their own messages and try them out. They learn as they formulate criteria useful to them to make judgment about effective communication on their own. They learn as they generate and process feedback about their work, and search for new ways to work. They learn as other students try out their communications on them. They learn as they provide reactions for others. Of course, involved in such inquiry lessons, students also develop a real appreciation for what is involved in effective communication and they also gain insight into their own values as they reflect on what it is that they want to communicate in the first place.

Inquiry in communication is a dynamic, high involvement, interactive process. When students take part in such inquiry they use the skills they've learned during previous language arts lessons and uncover new skills they'll need to learn in future language arts lessons. As they work they build theories about messages and means and they experiment with various ways of bringing their theories to life for others.

SOME THOUGHTS ABOUT HISTORICAL INQUIRY

By

Ben B. Strasser

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THE ACT OF HISTORICAL INQUIRY

Historical inquiry centers on "telling the story" of someone, something, or someplace. It may range from the less formal activities of Mother trying to find out what led up to her son's argument with the boy down the street, to the historian engaged in writing the history of the first wagon train to open the Oregon Trail. Although the motivation for creating these two kinds of "histories" differ, both center on amassing data about time, people, places, objects, events and conditions, and, on the identification of causal relationships among the data generated.

Like scholarly inquiry in other disciplines, the purpose and product of a historical inquirer's effort is a theory statement coupled with supportive data. The theory is his explanation for the event. One measure of a good theory is that it accounts for the data available and holds up long enough to get the inquirer to a better theory. Another measure of a good theory is how it holds up in the light of scrutiny by the historian's contemporaries, students, and lay people. A measure of powerful theory is that it interrelates with other theories developed by other historians about related events and continues to account for new data which become available in the future.

In their work, historians are confronted with generating data about something that happened in the past. Because they usually are unable to observe or experiment with the events they study, they have to rely on other means of generating such data. Perhaps the greatest difficulty they face is finding data sources to generate the data they need, and, validating the data they generated. For example, historians may interview people who observed or participated in the event under study. Using this data generating process raises the question, "Is the interviewee reporting actual events as he saw them or might he be deliberately or unknowingly building up or under playing some aspects of it because of some of his own values or biases?" Of course, historians may turn to various pictorial written records, if some can be found. In some instances, one historian may turn to the work of another historian about a related problem to see if his work "fits" with what the other historian has done.

They may use modeling or simulation as a way of generating data. And, where possible, they may spend time on the actual site of the event they are working on, "kicking around in the dust" in the hopes of uncovering something to stimulate their thinking or of finding something which had been overlooked before.

In addition to using data generated by interviewing, observing, checking various records, or by checking the work of other historians, historians also work with "we-believe-it-to-be" data which is derived from existing data. This kind of data is frequently called inferential data. For example, if a person enters a cave in a Southwest desert and finds what is judged to be a real pictograph (rock painting) on the walls of the cave, it's sensible to conclude that Indians were in that cave at some time earlier in history. Data: the pictographs, where they were painted, the subject of the work, etc. Inferential data: the presence of a certain Indian tribe who are known to have used those kinds of paints, who used that painting technique, and who painted that type of pictograph.

In some instances a theory may never go any farther than to exist only in the mind of the inquirer as a solution for an intriguing, perplexing, or needs-to-be-solved problem as in the case of the Mother and her son's argument mentioned earlier. In some instances the theory may be recorded in one form or another for the inquirer's use alone. In other cases it may become a written, graphic, or mediated statement intended to communicate the history to historical scholars or to lay people.

Often, a historical inquirer wants to communicate his theory to others, expecially in the case of scholarly inquiry. The way a history is told, however, usually differs with the individual or with the problem. For example, some histories may be told from a chronological vantage point. First this event happened, then that happened, and so on. Or, the history may be traced through the lives of one or more people who were involved in it. In some cases final events may be

introduced first, then contributing or causal events (deemed causal in the judgment of the historical inquirer) may be dealt with. The history may be told in a format such as "You were there," or it may become a full length film or television program. Actually, the "writing" of a history is just as challenging, creative and stimulating to the intellect of the historical inquirer as was the actual work in the problem itself. Of course, one could view the "writing" of a history as an inquiry in communication, provided that data were also sought about the degree to which the "written" history communicates what the inquirer wanted to communicate.

HISTORICAL INQUIRY IN THE CLASSROOM

The major purposes of a historical inquiry in the classroom are both to develop the students' higher level cognitive abilities as well as to develop their understanding of how the information between the covers of history books came to be. What do the previous comments about the act of historical inquiry mean in the classroom? One observation we draw is that if students are to develop a viable concept of historical inquiry, they must have opportunities to experience the building of a history. As they do so, the students should find it necessary to identify and use their own data sources rather than going to the pre-screened, pre-digested, and pre-organized data of their text books. They must have opportunities to generate their own data from original documents, records, and pictures where possible, as well as to work with data others have generated. They must find ways to weave their data together in search of causal relationships among the data. They must wonder if the data they generate is valid and take action to validate their data to the best of their ability, rather than merely relying on the copyright data of their textbooks or the word of their teacher. And, they need opportunities to "match" their histories with histories others are writing or have written about the same or related problems. Finally, they must decide how they'll communicate their histories to others, and then do so. As a result they will experience both the glory of a good theory well told, and the limitations of the spoken, written, or otherwise mediated word in communicating hours of planning, thinking, searching, pondering, waiting, finding, listening, accepting, rejecting, and summarizing.

Of course, like other classroom events of significance, historical inquiry doesn't just happen because dedicated teachers feel it should. Students need a problem of historical interest to work on as well as an environment that makes it possible for them to work on the problem in their own ways. They need data accessible to them which is unscreened, unorganized and unvalidated if they are to experience the real excitement of the historical inquirer. They need chances to work with others at times and opportunities to work alone when they chose to. At times they'll need to be responsible only to themselves; to build a theory that makes sense to

them alone, without having to share their ideas with others if they choose not to do so. At other times they need to be held publicly accountable for the theories they have generated; accountable in the sense that they are able to demonstrate that their history does indeed "fit" with, and account for the available data to the satisfaction of others. They also need frequent opportunities to report and evaluate both the data sources they found and the various inquiry processes they've used. And, most important, they need a teacher who knows what to do (and what not to do) in order to make classroom inquiry possible, and who is able to utilize specific systematic teaching behaviors which are designed to help the students become more effective and productive inquirers.*

*See Ben B. Strasser, et. al., Teaching Toward Inquiry, National Education Association of the United States, Washington D.C., Copyright 1971.

Dalstra Inquiry Teaching Strategy
Inservice Education Program

TEACH FOR INQUIRY:

ANY DAY, ANY LEVEL, ANY SUBJECT

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Teach for Inquiry: Any Day, Any Level, Any Subject

BEN B. STRASSER

THE idea of "teaching for inquiry" is not only an *accepted* instructional technique—it's one that is being *encouraged* and *practiced* more and more frequently. And almost always teachers have built inquiry into their curriculum by "borrowing, buying, or inventing a problem"—that is, by developing a problem situation not connected with other current studies. A teacher may "borrow" a problem from another teacher who has created it, and then try it out with his classes. A teacher may also be furnished with problem situations and a data bank from commercial sources. Or he may invent and develop situations of his own for inquiry.

It is unlikely that problems obtained through either of the first two methods will in any way relate to other things going on in the classroom. That is not necessarily bad. After all, the problems that people are confronted with in their live-a-day world are seldom drawn from subjects they've just been studying! When a teacher uses such inquiry situations, students get practice in using their "inquirabilities" in a way that will be useful to them in later years. So it's a good idea to continue to use problem situations that aren't related to the curriculum.

But inquiry should also be a part of normal classroom activities. If learning how to inquire is learning how to learn, then children should have practice in learning how to learn math, science, social studies, art, and so on. Some of the successful subject matter lessons can become inquiry lessons—by making some changes in what the teacher does, what he expects and encourages students to do, and what he hopes to accomplish.

Inquiry lessons are distinguished from noninquiry lessons by four characteristics:

(1) *The inquiry lesson centers on a problem the students are to solve.* The "problem" may be to seek an explanation or theory, to decide a course of action, to look for a way of working, to make or create something, to learn something, and so on. Or the problem can be a combination of these.

(2) *The teacher assumes a nonjudgmental attitude toward students' ideas, explanations, theories, or solutions.* The major emphasis in teaching for inquiry is to help students expand their repertoire of ways to test the appropriateness of their ideas. If the teacher makes the decision as to which ideas and theories are correct, students will not have the opportunity even to learn that they have the ability to do it for themselves.

(3) *Students decide how they will test out their ideas.* Learning to inquire means learning to decide what data is needed to test an idea, what action should be taken to find the data, and then what the data means. Students must decide what processes to use, in what situations to use them, and afterwards, whether the processes were or were not effective. The teacher must make it not only possible for students to devise and implement theory-seeking and theory-testing strategies, but also must make it legitimate for them to do it. He must make them responsible for doing it.

(4) *Students discuss the processes and strategies they used.* The teacher encourages students who have worked through a problem to consider how they worked this time, and how the problem-solving strategies might be improved in preparation for the future.

To demonstrate the kinds of changes that should be made to make a traditionally oriented lesson into an inquiry lesson and the process of doing so, I'm going to describe an early primary lesson in language arts based on a "Sesame Street" episode. This lesson was chosen because it is brief enough to be easily described and simple enough to highlight the process rather than the lesson content. It demonstrates that inquiry can be done by children on this level, yet the process can also be adapted for any other level or subject.

The original version of this lesson was well done, showing student interest and good student-teacher relationships. Changing noninquiry lessons to inquiry activities doesn't mean changing from bad to good. It means changing goals and objectives.

Original Lesson

The purpose of the lesson was to help the children clarify their conceptions of *nearer* and *farther*. A small group was seated in a semicircle around the teacher.

T: Here's what we're going to do today. I'm going to pose a few questions for you. Listen carefully and you'll hear me use the word "nearer" or "farther" in each question. Your job is to see if you can answer the questions. Here's the first one.

STRUCTURING: A teacher sets a structure so students will know what they are to do as they work.

Which is farther from my lips, my knees or my hips?

S: Your knees.

T: Right! That's a good start. Here's another one.

MAKING A JUDGMENT ABOUT CORRECTNESS OF RESPONSE

Which is nearer to my hair, that box or the chair?

S: The box.

T: Anybody else?

PROVIDING "SOFT" CORRECTIVE FEEDBACK

S: The chair?

T: You've got it. Great. Let's see who can get this one.

Which is farther from this chalk, the tree or that walk?

And so the lesson continued. The teacher posed interesting rhymed questions and the students responded. Throughout, the children were very much involved. They sat forward on their chairs, watched the teacher closely, put up their hands as soon as a question was posed. They smiled in a satisfied way when the teacher said, "Right." Obviously they felt good about their participation. And the lesson objectives were met.

In considering the flow of the lesson, it is apparent that the teacher implemented several roles. He set a climate or structure within which the students could work productively. He asked questions to establish the substance for their thinking and talking. He provided the reward for "good thinking."

This teacher was also a source of corrective feedback for the students. That is, in one way or another the teacher let the children know which response was correct. A correct reply brought a nodded "Yes," a spoken "Right," "Good," "OK," "Uh-huh," and/or a posing of the next question. A wrong reply caused the teacher to look puzzled by the answer, say "Any other ideas?" "What do you think, Charlie?" "Hmmm," or "Well . . . ," or wait for another child to speak. Most teachers use these kinds of "soft" corrective feedback techniques at one time or another, and I'm not implying that they are wrong. Indeed, when instruction is intended for input of content or development of specific skills, teachers must let students know in one way or another when they have reached the goal. It isn't corrective feedback that is found objectionable by so many, but the way it's sometimes done: "You're wrong!"

Inquiry Lesson

Unquestionably the described lesson was well done, but as shown by comparison with our criteria, it wasn't an inquiry lesson. To make it one, the teacher would have to change his behavior and also his expectations of student behavior. In teaching for inquiry, a teacher structures the activity to make it legitimate for the students to theorize; makes it possible for students to generate data as and when they need it; and maintains open lines of communication with students. What he doesn't do also affects what students learn: He doesn't reward the students' work (the reward for successful inquiry is the solving of the problem, not the teacher's approval), or provide corrective feedback (students should be able to tell for themselves when they're on the right track and have solved the problem). As for student behavior, the teacher will expect them to design ways to find out if their ideas are right, carry out appropriate tests, and discuss how they worked through the other steps.

In the inquiry version, the objective remains to help children clarify their notions of *nearer* and *farther*, plus expand their repertoire of of theory-seeking and theory-testing behavior.

T: Here's what we're going to do today. I'm going to pose a few questions for you. Listen carefully and you'll hear me use the word "nearer" or the word "farther" in each question.

After I pose the question, you will have two jobs. First, see what you think is the correct answer to the question. Some people in the group may think one thing and some people may think another answer is correct. That's OK.

Your second job will be to figure out if your idea is right. Usually, in other kinds of lessons, I have told you if your answers were right or wrong. That will be your job in this lesson. Any questions? OK, let's begin. Here's your first question.

Which is farther from my lips, my toes or my hips?

S: Your toes.

T: OK, all agree? (Teacher pauses, then records the student's response in some appropriate way; for example, he may write the word on a chalkboard, or, for prereaders, circle an appropriate picture on a prepared chart.)

All right, here's the next one.

Which is farther from my hips, my knees or my lips?

S: Your knees.

T: (Records "knees.") All agree?

S: Your lips.

T: (Records "lips.") OK?

Here's your third question.

Which is nearer to my hair, the box or that chair?

STRUCTURING: A teacher sets a structure so students will know what they are to do as they work.

MAINTAINING A NONJUDGMENTAL ATTITUDE: Whatever the answer, the teacher provides no cues as to what he feels is correct.

Note that questions posed in this lesson cover comparison so close that measurement will be necessary to decide what is correct.

And so the lesson continues. About five or six such questions are posed, depending on how many the teacher feels the children can answer and still remember their first responses. At that point, if students don't raise the questions, "We had two answers for the second one. Which is right?" the teacher shifts the emphasis from having the children "theorize" to having them figure out how to test their answers.

T: Let's review what we've done so far. This was our first question: Which is farther from my lips, my toes or my hips? Everyone felt that "toes" was correct.

The second one was: Which is farther from my hips, my knees or my lips? We had some different ideas about that one.

(Teacher pauses. If no one suggests testing the two possibilities, he makes remark to guide them.)

Does anyone have any ideas about how you might work to find out which is correct?

STUDENTS DECIDE HOW THEY WILL WORK

If the students don't make any suggestions, the teacher has four alternatives. He can go on to the next question in an attempt to communicate the notion that if they want the problem resolved they will have to initiate an action. "Perhaps you want to think more about that one. Should we go on?"

A second alternative is to help by asking, "How might you find out which is farther for yourselves?"

A third is to suggest an operation the students can use. "Is there any way you can compare the distance from my hips to my lips (pointing) with the distance from my hips to my knees, to find out which is farther?"

A fourth way is to make a more specific sugggestion, as: "Is there any way you can use a piece of string to compare the distance from my hips. . . . " Notice that each alternative provides increasingly more detailed help for the students. Keep trying to stop at an earlier step. The goal is to have children learn to test their ideas without any such support.

As students suggest ways to test their ideas, they are invited to carry out the proposed tests. Thus, they not only find out for themselves which theory or guess is best; they also gain experience in the intellectual task of moving from idea to test to idea substantiated or discarded.

If the children's interest is maintained and time permits, the teacher may pose a second set of three or four questions. Or he may invite students to devise some of their own *nearer-farther* questions to which the group will respond.

At the end of the lesson, the teacher spends a few minutes inviting children to recount the ways they went about testing their ideas. They can also consider other ways they could have proceeded. To stimulate such thinking and discussion, the teacher can ask questions like these —not all at the end of any one lesson, but over the course of several:

- **What are some of the ways you've tried to find out for sure which thing was nearer or farther?**
- **Are there any other ways of testing that you thought of that we didn't try this time?**
- **How do you decide what to do to test your ideas?**
- **With this kind of problem, how do you decide which ideas are correct?**
- **Will you do anything differently when we do this kind of lesson again?**
- **How do you feel about what you did in the lesson?**

In comparing the two types of lessons, it becomes obvious that inquiry lessons take more time, more materials, more planning, and more effort on the part of students as well as the teacher. Instead of taking 10 to 15 minutes, for example, this lesson could take 15 to 20. Materials are needed for recording and testing—in this case, measuring. For more advanced lessons, the requirements for testing theories could be quite extensive, and include such thing as appropriate references. It takes more planning to elicit the desired student response.

Is the extra effort worthwhile? Probably the children would learn the *nearer-farther* concept equally well with either method. But there are hidden learnings. The first way, children learn that to find out about things, you ask someone who knows; students needn't be capable of deciding what's right; knowledge and meaning come from authorities, and it's the individual's responsibility to listen to the authorities to find out what is right. The inquiry method teaches that there are rational ways of testing ideas; students are capable of using them to make decisions about what is right; knowledge is testable and accessible to all, and it's the individual's responsibility to take action to find out which ideas are most appropriate to the problem at hand. They learn either that coming to know is passive or that it is active.

Which way is better? It all depends upon the teacher's objectives. And only he can decide what they are.

THE PROCESS DIALOGUE

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THE PROCESS DIALOGUE

If students are to learn to read, whatever else they do, they should read. But learning to read involves more than having a book in hand. At times the students and their teacher also engage in a dialogue about what they will read or have read. And, they also discuss difficulties they encountered in trying to read, words they couldn't figure out, meanings not clear, and new words and meanings they were able to figure out for themselves.

In learning to read, then, the students spend most of their time reading. And some of their time is also spent in an open dialogue about what they've done, what they didn't do, and how they feel about their work.

This is also true of students learning to inquire. Most of the lesson time is spent in working to solve problems suitable for their inquiry. And, as in learning to read, they also participate in a discussion about what they've done as they worked, what they learned about solving problems, the various difficulties they encountered as they worked, what they will do differently as they work on their next problem, and so on.

The inquiry activity is organized into two discrete parts, working on a problem and the process dialogue, because of the way people think and work comfortably. When anyone is caught up in solving a problem it is difficult for them to interrupt their thinking and discuss something else, i.e., a question posed by the teacher such as "What are you doing, Dennis?" As a result, there are two times when a teacher-initiated process dialogue is most effectively used, before work begins on the problem, and/or after work is stopped. As students get ready to work, how they're going to go at it is likely to be a prime concern. It also serves a useful purpose for the student when his work on the problem has stopped, either because the problem has been solved and another productive strategy has been discovered, or because he has "run dry" and needs help from others. (Note, however, that students may initiate their own process dialogue during their work on a problem. In such instances, the teacher should permit the process dialogue.)

Another reason why the process dialogue is generally used before and/or after the students work on the problem is that the process dialogue is a group activity, while the working on the problem is essentially an individual effort.

"INQUIRING IS AN INDIVIDUAL ACT, WHILE
LEARNING TO INQUIRE IS A SOCIAL PHENOMENON"

As the students' ability to think and talk about inquiry strategies develops, a new kind of focus for their inquiry emerges. Each inquiry problem becomes an opportunity for the students to experiment with new strategies they have created or heard about from others in the class, or to revise or reuse strategies they used earlier. Thus:

In the PRESESSION PROCESS DIALOGUE	Students THEORIZE about theory-seeking/theory-testing strategies they want to try.
During their WORK ON THE PROBLEM	Students TEST OUT the strategies they've formulated.
And, in the POSTSESSION PROCESS DIALOGUE	Students EVALUATE the theory-seeking/theory-testing strategies they have used, identify advantages and limitations of those strategies, and make revisions or alterations of them for their next time out.

The process dialogue is the means by which the teacher takes deliberate and systematic action to help the students learn from their experience, so they will get better at it. The success of the process dialogue must be measured in terms of the students' increasing ability to respond to problem situations systematically and effectively.

Perhaps the most crucial aspect of the process dialogue is the context of the discussion. That is, the students must know that their purpose is to identify alternative ways of working to solve problems -- with which they can experiment as they wish -- as they choose to. It is not to suggest that there is one way to work, or a best way. The greater the alternative ways of working open to them, the greater will be their chances of being successful in their work.

THE FUNCTION OF THE PROCESS DIALOGUE

It is crucial that the teacher recognize that his process dialogue questions may serve three different functions for the students, depending on where they are in their development at the time. The effect of a process dialogue question on a student may be inferred from his response. (No response is a response!) Consider the possible responses to a process dialogue question which follow:

T: What might you do to get started working on a new problem when you don't have a theory?

* 1 Time passes and none of the students respond. The teacher might want to follow up by stating something like, "Perhaps you want to think about that as you get to work on the new problem today." (Structuring to take the students "off the hook.")

* 2 Some of the students respond, but with strategies not relevant to the question. These, of course, should be treated in precisely the same way "ideal" responses would be treated, i.e., use an ACKNOWLEDGING teacher behavior. If appropriate, invite the students to try them out as they work on the next problem.

* 3 The students respond with "ideal" theory-seeking strategies.

In situations such as those represented by * 1 and * 2, it seems plausible to conclude that the students have not conceptualized any theory-seeking strategies as yet, at least to the point at which they're able (or wish) to talk about them. Even though the teacher's process dialogue question does not get answered, it does stimulate the students' thinking. Watch what happens next time the same question is posed – perhaps at the end of the inquiry activity or a few sessions later. When the students don't respond overtly, the teacher shouldn't feel pressured to push them to speak. The desired effect is to stimulate the

students' thinking about the topic and to get some clues about their present level of development. And that effect will be achieved without any pushing, probing, guiding, directing, etc.

In situation #3, in which the students in the group report theory-seeking strategies, the students who report are demonstrating that they have begun to conceptualize a particular strategy. And other students in the group listen and have opportunities to try those strategies out for themselves as they feel they need to – and want to.

Thus, the process dialogue serves to:

Stimulate the students' thinking about inquiry processes and strategies.

Provide the opportunity for one student to hear about ways other students have worked on the problem – ways they too may want to try as they begin work on the next problem.

Facilitate their conceptualization of various theory-seeking and theory-testing strategies as students report their ways of working.

Generate one kind of diagnostic data about the development of the students' repertoire of inquiry processes and strategies.

ORGANIZING FOR THE PROCESS DIALOGUE

Teaching approaches often lose their effectiveness when they become overformulized. That is, they are used each day in exactly the same way. Every lesson begins as the lesson before it began, develops along the same lines, and ends in the same way: in boredom. Obviously, the effectiveness of the process dialogue can suffer from overformulization in the same way.

To overcome this possible limitation, a variety of ways of using the process dialogue have been developed. Each alternative yields slightly different objectives with the students.

• 1 THE OPEN DISCUSSION

One alternative is to involve the students in an open discussion about their inquiry before and/or after their work on the problem. The students may discuss issues or questions posed by the teacher. Or, the teacher may raise issues identified by the students during their work on the problem(s), e.g., "How do you know when a theory is the right one?"

The students' ideas may be noted on the chalkboard, a transparency, or a chart, so that the group can revisit the "list" at the end of the inquiry activity and/or at some later time. As the students then suggest additions, deletions, or revisions, evidence of their growth becomes readily apparent.

• 2 REVIEWING A TAPE OF THE INQUIRY ACTIVITY

Another kind of process dialogue may center on the use of an audio-tape recording of the inquiry activity. The teacher and students listen to portions of a recording of their inquiry work. Questions about the tape provide a focus for the discussion:

T: What are you doing here, Charlie? (Probe for Process Awareness)

T: What were you trying to do – that is, were you building or testing a theory? Or something else? (Probe for Intent Function)

T: How did _____ work out for you? (Probe for Intent Function)

3 THEORY-TESTING DISCUSSION

A third variety of the process dialogue is a theory-testing discussion. It's an inquiry "by the numbers" so all of the students can direct their work to the same issue at the same time – so each can see what the other is doing and thinking about. Actually, this process dialogue is a kind of mini-skill development teaching lesson coupled with the inquiry activity.

T: Today we'll try something different. This will be a skill-building activity in which we'll practice stating theories and designing ways to test them. We'll work together as a group for the whole lesson. O.K., here's the problem: Why does . . .?

T: First, let's make a list of all the different theories we can think of. (We can add to this list later on if you'd like to.)
(The students brainstorm to produce a list of plausible theories.)

T: Now, let's try out the first theory and see how we might go about testing it.
(The students design processes to generate, organize, and use data.)

T: How does that theory seem – does it work out, should we revise it, or should we forget it?

T: How do you decide whether the theory should be . . .?

T: Is there anything else you think should be done further on this theory?

4 THE OBSERVER'S REPORT

A fourth variety of the process dialogue is to use it as a reporting time with a panel of observers. In this case the lesson is structured by inviting part of the class to serve as observers during the work on the problem. Each "observer" is paired with a student who is working on the problem. The observer keeps track of the students' theories, the processes used, the data generated, etc. At the end of the work time, the observers report their observations. Of course, ground rules should be drawn up so that the reports made are supportive of the students' growth.

5 OMITTING THE PROCESS DIALOGUE ON OCCASION

Another alternative helpful in overcoming the repetition of the "same process dialogue, time after time" is simply to omit it on occasion. For example, in one case it may not be used because the students are so involved in the problem that it is more in their interest to let them continue work on it using all of the available time. In other instances the process dialogue may be omitted just because the group has had a process dialogue in several preceding inquiry activities.

In electing to use this alternative it should be kept in mind that the process dialogue serves a unique function in facilitating inquirer growth. The growth of students as inquirers can be traced directly to their continuing participation in a group dialogue about processes, strategies, etc., coupled with their work on problems. If deleting the process dialogue becomes a habit, certain kinds of inquirer growth may be sacrificed.

There are, of course, many other ways of using the process dialogue. The task for the teacher is to find a set of ways that will be interesting, thought provoking, idea generating, and growth facilitating for the students.

SELECTING PROCESS DIALOGUE QUESTIONS

One of the teacher's roles in the Process Dialogue is to identify appropriate questions for discussion by either selection process dialogue questions or by making questions the students raise about ways of working legitimate for discussion. Some criteria useful in selecting Process Dialogue questions are:

1. IT'S AN ISSUE WHICH THE STUDENTS HAVE RAISED IN THEIR OWN WORDS.

   "How can you tell when a theory is a good one?"

2. IT'S AN ISSUE WHICH THE STUDENTS HAVE DEMONSTRATED IN THEIR WORK ON THE PROBLEM. For example, as the students worked, some in the group actually used their theories to predict an event. They carried out an experiment to find out that they were right. In the Process Dialogue the teacher posed the following questions:

   "How does using your theory to make a prediction offer you another way of testing it out?"

   "How do you know what your theory will predict and what it won't predict?"

3. IT'S A PROCESS DIALOGUE ISSUE OR QUESTION WHICH WAS POSED AT AN EARLIER TIME BUT WHICH WAS NOT ANSWERED, OR ONE FOR WHICH THE ANSWERS WERE VERY GENERAL AT BEST AND FURTHER SPECIFICATION MAY BE THE ORDER OF THE DAY.

   "How do you go about getting started on a new problem?"

4. IT'S AN ISSUE WHICH - IN YOUR OPINION - THE STUDENTS MAY BE READY TO CONFRONT AS SUGGESTED BY THE WAY THEY'RE WORKING ON PROBLEMS.

!LLUSTRATIVE TOPICS FOR THE PROCESS DIALOGUE

Following are some illustrative questions which may be posed for the students' thinking during the pre- or post-session process dialogue. Certainly the students will raise questions which are very appropriate for discussion. And the teacher must provide the time and "legitimate" status leading to a productive discussion about them. The questions and issues the students raise, however, may not cover the range of possible process learnings which may be a product of their inquiry. In this case the teacher may pose questions such as those which follow to stimulate the students' thinking. The following illustrative questions are appropriate for students at several age levels. The teacher should select those most appropriate for the students with whom he or she is working.

It should also be noted that one question or topic for discussion may be used over the course of several inquiry activities because of experience, the students can respond to it with ever increasing sophistication.

The order in which the following questions are listed does not imply a developmental sequence. In some cases one question may be a restatement of another question. When using any of these with a group of students, it may be necessary to change the wording to make them more suitable for the particular students, or to build them into the context of the specific lesson topic.

GENERAL STRATEGY TOPICS

- How do you decide what to do as you work on a problem?
- What did you do as you worked this time that you felt really helped you more along toward solving the problem?
- What will you do differently next time?
- In what ways does a conference help you work on a problem?

- How do you know when a problem is solved?
- What is a "problem"?
- How do you know when you have a new problem?
- How do you decide if a problem is suitable or appropriate for you to work on?
- How do you decide what problem you'll work on?

THEORY-SEEKING TOPICS

- What can you do to get started on a new problem when you don't have a theory?
- When you don't have a theory and you want to get started by generating data, how do you decide what data to get?
- When you've started work on a problem by generating data – in search of a theory – how do you decide what data are important and what data can be forgotten? (Consequential variables)

THEORY-TESTING TOPICS

- Do any of you have a theory you think is a good one (in relation to the problem we've been working on)? How do you know?
- Do any of you have a theory you feel is no good – or that you want to think about some more (in relation to the problem we've been working on)? How did you decide it was no good?
- Once you have a theory when you're working on a problem, how might you go about testing it, to find out if the theory is a good one?

- When you have more than one theory that seems to explain the same thing, how can you decide which one is better? – more powerful?

TOPICS IN RELATION TO DATA, DATA-GENERATING, DATA-ORGANIZING, AND DATA-USING PROCESSES:

- What are data?
- What good are data?
- What are good data? (What do we mean by "good"? How do we decide whether data are good or not?)
- In what ways are data related to theories?
- In what ways do you use data as you work on a problem?
- How do you decide what data you need as you work on a problem?
- How do you decide what you will do to get the data you feel you need?
- In what different ways can you generate data?
- What are some different ways to generate data? How do you decide which one to use?
- When/under what conditions would you experiment to generate data?
- How is an experiment different from one or all of the other ways to generate data?
- What can you do to make certain that the data you get are good data? How do you go about it?

- How do you decide how you'll organize your data?
- What are some different ways of organizing data?
- How do you know whether or not you need to organize your data?
- How do you decide what the data you get means in relation to your theory – whether or not it supports your theory?

TOPICS IN RELATION TO THEORIES AND THEORY-USING PROCESSES

- What is a theory?
- What is a good theory? (What do we mean by "good"? How do we decide whether theories are "good" or not?)
- What good is a theory?
- How do you decide if a theory is a good one?
- How do you identify the limitations of your theory?
- How do you know when you're on the right track?
- What are some ways you use a theory?
- How do you decide what your theory will predict and/or explain and what it won't?
- How do you use a theory (or theories) to build an explanation?
- Is there any difference between a theory and someone's opinion?

- Can you ever know for sure if a theory is "right"?
- Can you ever prove a theory true? Under what conditions? What kinds of theories?
- How do you identify assumptions in your theory?
- How do you check out the assumptions of your theory?
- In what ways are theories related to data?
- How do you decide how to revise a theory?
- How do you know when to discard a theory? On what basis?

POST-SESSION TOPICS

- Did anyone try _____ (referring to a strategy outlined on a chart of problem-solving strategies) as you worked today? How did it work for you?
- What will you do differently next time we work?
- Did you change any of your ways of working today?
- What have you found out about working on problems from your work today?
- Does anyone have anything to add to the chart of problem-solving strategies? Is there anything you'd like to change?
- How do you decide which problems are inquirable and which are not?
- How is your work on this problem similar to (or different from) your work on _____ problem? (Problems of the same and different content areas.)

Dalstra Inquiry Teaching Strategies
Inservice Education Program

STUDENTS AS LEARNING STRATEGY THEORISTS
A New Arena For Classroom Inquiry

By

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STUDENTS AS LEARNING STRATEGY THEORISTS

PART I: THE CONCEPT

The notion of students as learning strategy theorists we deal with in this paper was stimulated by two observations. One evolves from something we've all experienced. Does "The way to really learn something is to teach it" sound familiar? It sure seems that way. If it's true, it follows that the only one who really learns in the classroom is the teacher. Yet, the teacher teaches so the students will learn! A paradox.

The second observation is an outgrowth of our work in teaching toward inquiry. While we continue to work to build student's repertoire of problem solving strategies in different curriculum areas, we've overlooked one realm of problems of great concern to most students; that is, the development of their repertoire of learning strategies. It's what they need as they come to grips with what they have to learn, what they should learn, or what they want to learn. Inquiry into learning strategies respond directly to this need.

A LEARNING STRATEGY

We noted earlier that one way to really learn something is to teach it. Perhaps this is true because in preparing to teach something the teacher must give some thought to:

* how the learning is to unfold, where it starts, how it develops, and where it goes.

* what the students are to do as they work; how they'll go about it.

* how the students are to be organized for the job

* what materials they'll use

* how to determine when the students have learned and what they'll do if they have not.

In building a set of responses to these decisions, the teacher designs a learning strategy for his students. During the lesson it's the student's job to follow their teacher's plan. What the students learn as a result, in addition to the lesson objective, is to follow directions. But learning to follow directions is not the same as developing a repertoire of learning strategies. For many kinds of learning tasks, building the learning strategy is the real challenge to the creative intellect; that's where the fun is. When students don't have opportunities to engage their wits in these ways, the teacher is the only one in the classroom who finds his creative intellect challenged in this way. Teachers have all the fun!

LEARNING *ABOUT* LEARNING AND INQUIRING *INTO* LEARNING STRATEGIES

It's important to note that there is a difference between learning *about* learning–as is presently done in many classrooms, and inquiring *into* learning strategies. Learning *about*

learning usually involves reading about experiments in human and animal learning, reading about or listening to theories about learning, and, spending time discussing it all.

In general, inquiry means finding or creating ideas and developing ways to test them. When students are permitted to inquire *into* learning strategies, they become both intellectually and affectively involved. They formulate their own learning strategies as they decide how they'll go about learning something in particular, such as the multiplication tables, word usuage, spelling, graphing, word recognition, etc. They try out their plan by actually doing it, perhaps revising their ideas along the way. They judge the success of their learning strategy based on how well or how much they learned, and they report their learning strategies and how well they worked to other students. (One measure of a "good" learning strategy is mastery of the learning task at hand. A second measure of it is the degree to which the individual enjoyed the learning process and feels good about the outcome. Other considerations might include how long it took, and so on.)

Throughout such inquiry, the emphasis of instruction is on the students' mastery of the learning task. When it turns out that a student hasn't done well--assuming the lesson objective was properly matched to his capabilities--it doesn't mean he's dumb. It's just that the learning strategy he used didn't work for him. Big deal. Find another strategy and go at it again.

It's individualized instruction carried to its goal; individualized learning.

THE CURRICULUM

Certainly we do not recommend that every subject every day be assigned for students' inquiry into learning strategies. That's foolishness. The teacher is in the classroom as a professional who (hopefully) knows what he has to know about his students, who knows something about what he's supposed to be teaching, and who knows something about human learning. He's getting paid to use what he knows to do his job. We are suggesting, however, that developing the student's repertoire of learning strategies is a high priority

objective most curricula let go to chance. It won't happen unless the teacher decides it should, and unless he does something about it. While this area may be "visited" at times through curriculum topics such as "learning about learning" and courses such as "study skills," these lessons don't do the same job as inquiry into learning strategies for the students. The goals are different. What students do and learn is different. Learning *about* learning is learning from the outside, in.

Developing the students' repertoire of learning strategies is perhaps one of the most significant and legitimate goals of our educational system. One way to go about it is to get the students involved by inviting them to formulate, use, evaluate and report their own learning strategies. It's called learning from the inside, out. Using this approach, many of the lessons teachers (and the student) normally view as the more "dull" teaching tasks become rich opportunities for the students' inquiry. The results are increased commitment to and involvement in the process of education, maximized motivation and learning, the enhanced self-concept of the students, and the development of some unique intellectual tools the students will use the rest of their lives.

How can we miss?

PART II: THE CLASSROOM

In general, a lesson intended to develop the students' repertoire of learning strategies takes time. Actually, an inquiry into learning strategies devoted to the six times tables, for example, has taken a week. (But then, it usually takes weeks to do the same thing with "usual" teaching strategies.) This includes informing the students of what they are to learn, giving them time to think about and discuss possible learning strategies they'll use, time to get to work to try out their ideas, time to find out how well they've done, and time to report how they worked and to compare their strategies with others.

Of course, the total lesson time is a function of what it is the students are to learn. Regardless of how long it takes, the inquiry into learning strategies usually (though not necessarily) moves through five phases. They are:

Phase I	Structuring and Setting the Lesson Objective
Phase II	Planning the Learning Strategy
Phase III	Implementing the Learning Strategy
Phase IV	Evaluating the Learning Strategy
Phase V	Discussing Their Findings

More than one phase may be accomplished during one lesson period, or one phase may take two or more lesson periods. The duration of the phases will be modified by the student's experience. For example, after the students have participated in these kinds of lessons a few times there will be little need for as detailed a structuring as for the original lessons.

Phase I: Structuring and Setting the Lesson Objective

During this initial phase the teaching sets the stage for the lessons by letting the students know what they're going to be doing, reviews the lesson phases, what their responsibilities will be and what they can expect from their teacher.

Once the students understand what they'll be doing in general terms, the teacher communicates the lesson objective. Above all, the objective should be phrased in a way that the students will be able to recognize when they've mastered the objective for themselves.

> *"It's going to be your job to learn the four times tables. You know, like 4 x 1 = 4, 4 x 2 = 8, and so on. As a test to see if you know them you should be able to do the 4's flash cards with no more than 3 seconds for each one. Like this.* (Holds up card. Waits 2 seconds and give the correct answer.) *Everyone understand?*

Probably one key in deciding which lessons are suitable for an inquiry into learning strategies is that it is possible to express the lesson objective in this way. As students become more familiar with the lesson format they may participate in selecting these learning tasks they would like to work on in this way. Conceivably, the students may also be involved in actually formulating objectives in performance terms as well.

The teacher also puts a time limit on the students' work. (Which, of course, may be modified as the students work.)

> *It's going to be your job to find a way to learn these by--let's see, today is Thursday, by next Thursday. For those of you who want to, I'll give you a practice quiz on Tuesday so you can see how you're coming along."*

Phase II: Planning The Learning Strategy

During this phase the teacher invites the students to share any first ideas they have about how they might go about the learning task. It's a search for alternatives; a kind of strategy brainstorming session.

Any approach should be within bounds except those that put the responsibility on someone else to design and implement the strategy for the students. For example, if a student says, *"You teach me, Mr. Cowan."* The teacher should respond with something like, *"Sorry Bill, it's your job to design your own learning strategy for this lesson. You can work with a partner if you wish. He can be the teacher for you. But you'll have to tell him (or her) what you want him to do as he teaches you. So even if you do find a teacher, you still have to decide what the teacher will do to teach you."*

As the students report their ideas, the teacher records their ideas on the board along with the student's name (Billy's strategy).All of the strategies reported should be recorded in the student's words. That is, none should be "weeded out", changed, or otherwise restated by the teacher. The students must feel that the strategies listed on the board are their own, not some created by their teacher.

Whenever a student reports a learning strategy, the teacher should invite him to be as specific as possible, perhaps giving an example of what he means, as appropriate. However, in instances in which this may put a student "on the spot," it shouldn't be used. All ideas should be recorded even if it doesn't make any sense to anyone but the student who suggested. it.

As the discussion continues, the students should be informed that as they begin work they aren't restricted to using just those strategies listed on the board. They may change one listed, or, they may invent a different one. Or they may begin with one of the strategies listed on the board but change to another as they work. That's OK too. The students must feel free to choose their own learning strategy in the light of their own abilities and interests.

As the students begin to "run down" or if the talk time gets too long, bring the strategy discussion to a close. Then discussion may then shift to consideration of any special materials needed but which are not normally available to the students in the classroom. In addition to recording their needs, the teacher may inform the students of additional materials she or he feels may also be useful to them.

Above all, this strategy planning session should be kept relatively short and low key, especially for their first times. The session is just some time to brainstorm some different ways they might go about their work. If some students don't feel comfortable with any of the strategies listed, invite them to "just get started." They'll think of something. Or, they can work with someone else and use his strategy.

If a student wants to experiment with a strategy she or he will implement at home, that may be OK too. However, it will be up to her or him to decide how he or she will use the in-class time while the other students are working. She or he could work on other school work or use the time to help someone else. The student decides. Whatever the student does, however, may not interfere with the work of the other students.

Phase III: Implementing the Learning Strategy

During this part of the lesson the students put their learning strategy to work for them. It's time to "do their thing". The role of the teacher is to make the classroom responsive to their needs by helping the students keep things going as they want them to go. In addition, the teacher moves about the classroom watching the students at work, asking them how it's going and, in general, expressing interest in what they're doing. The teacher may also help the students recognize changes in their learning strategy that they might have made.

Another role of the teacher is to provide data for the students about how they're doing, before the "moment of truth" time. For example, after the students have had some time to work (about two days in the case of the multiplication lesson) the teacher might offer an occasional "check-up" quiz which won't be graded or collected.

Because of the individual directed nature of this work, the teacher may want to keep the students' first work periods short. On occasion the work period may close with a short discussion initiated with the question, "How is it going? Any problems?"

If any special problems do arise, the teacher may want to give the students time to explore possible alternative solutions.

Phase IV: Evaluating the Learning Strategy

The lesson objective was introduced in Phase I. The purpose of the evaluation phase is to give the students an opportunity to reveal their mastery of the skill or knowledge specified. It's time to demonstrate how well the learning strategy they choose to experiment with worked for them. In some instances, such as in using some paper and pencil test, the entire class may be involved in the evaluation phase simultaneously. In other cases, the teacher may want to work with small groups or individual students to more effectively observe their mastery of the learning objective.

Phase V: Discussing Their Findings

During this final lesson phase, the students (who wish to do so) report precisely what they did as they work, how their strategies worked for them, changes they made in their strategies as they worked, and so on. The teacher may review the strategies initially listed on the board and ask if anyone used the first strategy, the second one, and so on. Thus, "good" strategies become the property of the whole class available for anyone's use in the future.

Another alternative for this phase might be to invite students to comment about the strategy they used. They should be encouraged to report the "good" as well as the "bad." That is, learning about what a strategy doesn't do is just as valuable as finding out what it will do.

When students' learning strategies fall short of their expectations, they may initiate a search for a new strategy that will hopefully work for them. Thus, students who may not have done well cycle themselves back into Phase II, Planning the Learning Strategy, Phase III, Implementing the Learning Strategy, and so on.

The importance of Phase V in facilitating the development of students' repertoire of learning strategies cannot be over emphasized. Experince alone isn't necessarily the best teacher; experience reflected on is. These strategy discussions provide some time both for the students to reflect on how they worked, and to consider other alternatives open to them. Without this phase, it's doubtful that the student's repertoire of learning strategies is as significantly influenced by the experience as it might be.

PART III

THE INQUIRY DIAGNOSTIC TEACHING BEHAVIORS*

As the teacher observes students at work, he or she can learn much about how they go about solving problems — about their repertoire of inquiry processes and strategies. As the teacher observes the student's responses to the Inquiry Goal Directed teaching behaviors, he or she gains additional insight into their present abilities to inquire. At times, however, the teacher will find it necessary to take direct action to generate some additional data about the students that may not otherwise be apparent.

As with other teaching behaviors that begin with the term "probe," these teaching behaviors should be used only when the teacher is reasonably certain that the student will be able to respond. They should also be expressed in a tone of voice that makes students feel comfortable in choosing not to respond if they wish.

The following are direct actions that can be taken by the teacher to generate data about students as they work on a specific inquiry problem.

- PROBE FOR PROCESS AWARENESS (PPA)
- PROBE FOR PREDICTION/EXPLANATION (PP/E)
- PROBE FOR STUDENT'S THEORY (PST)
- PROBE FOR STATUS OF STUDENT'S THEORY (PSST)
- PROBE FOR FEELINGS (PF)
- GIVING FREE DATA (GFD)
- GIVING THEORIES (GT)

*Part III of TEACHING BEHAVIORS RELATED TO THE DALSTRA INQUIRY TEACHING STRATEGY

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PROBE FOR PROCESS AWARENESS (PPA)

The primary function of this teaching behavior is to determine if the students are becoming (1) aware of the inquiry processes and strategies they're using, and/or (2) sensitive to the way the group is responding to the problem. Thus, the Probe for Process Awareness teaching behavior may be used with an individual in relation to something he did or with the group in relation to their work.

T: *Gloria, what would you call the process you used when you did the same thing I did, except you used a paper towel?*

T: *What do you call that — when someone takes all of their data and puts it together on a chart as you have?*

T: *I notice today that no one in the group is sharing any theories. What's going on? Anyone care to comment?*

PROBE FOR PREDICTION/EXPLANATION (PP/E)

As a way of helping the students explore the power and/or limitations of their theories, and to ascertain whether or not the students are able to do so, the teacher may use a Probe for Prediction or Explanation.

T: *Vinnie, what do you predict will happen if we dry the head of the dunking duck? Will it still bob up and down, will it move more quickly, will it stop, or what? What do you think? (Prediction)*

T: *Jamie, how does your "depletion of cool theory" explain the fact that there are no buildings standing on that site today?* (Explanation)

PROBE FOR STUDENT'S THEORY (PST)

When students first participate in inquiry activities, many begin work by stating their theories. But as their repertoire of Data Generating and Data Using processes develops most students begin to take some action to test out their ideas before they state them to the group. Some students may work on theories which they never state at all.

In the case of a student who has not stated a theory, but all of whose processes seem to center on a particular idea, the teacher may want to use a Probe for Student's Theory to find out if, indeed, the student has a theory.

T: *If you have a theory, Bob, would you mind sharing it with us?*

T: *Pam, what is your theory about what happened to this town?*

PROBE FOR STATUS OF STUDENT'S THEORY (PSST)

As a student works on a problem he may find that his theory is supported by the data, that it is in need of revision, or that the theory should be discarded. Frequently he will come to one of these conclusions without making any comment about it. Because inferences about a student's growth as an inquirer are drawn in part from the bases on which he keeps, modifies, or discards a theory, there are occasions on which the teacher will want to use a Probe for Status of Student's Theory to invite the student to report how he feels about a theory he has been working with.

T: *How do you feel about your old junky places theory now, Fritz?*

So that the Probe for Status of Student's Theory doesn't come to serve as a cue to the students that their theories are either correct or incorrect, the teacher should strive to use it in both circumstances.

PROBE FOR FEELINGS (PF)

We have noted various ways in which the teacher can offer help to students who appear unable to test their theories on their own. Some students at this stage, disillusioned and feeling they are getting nowhere, will lose interest in the activity unless they are given help. Other students at the same stage, however, will prefer to go on matching their wits with the problem in their own ways. How a student feels about himself and his work is the basis on which the teacher must decide when to help and when not to. He can find out the student's feelings by using a Probe for Feelings teaching behavior. Usually this is best done with the total group during the process dialogue. This is the time when students are given a chance to reflect on how they have been working on the problem.

T: *How do you feel about what we've been doing today?*

T: *How do you feel about how we've been working?*

It should be noted that feelings of frustration at not being told which theory is "right" are common and to be expected of students involved in their first inquiry activities. These feelings result from the students' desire to solve the problem (the problem was suitable for them because they wanted to solve it) but being unable to do so because of their limited repertoire of inquiry processes and strategies.

Feelings of frustration are natural as students grow to become more effective inquirers. Frustration creates the need for students to talk about and experiment with different ways of working because if the students were able to solve the problem, they wouldn't need to develop any new strategies. It is these feelings that make group discussion about ways of working so relevant.

GIVING FREE DATA (GFD)

Within the context of an inquiry activity, the student may not seek some data he needs directly; he may start a guessing game. In science for example, the student may start guessing at the temperature of an object or of some material. In a "real" situation, however, an inquirer would not guess at the temperature — he would get a thermometer and find out.

A teaching behavior useful to prevent the student's inquiry from degenerating into a "data guessing game" is called Giving Free Data.

T: *Since we don't have the necessary equipment to measure the temperature, rather than force you to go on guessing, I'll tell you that it's . . .*

Another use of this teaching behavior is to reinitiate a student's inquiry when he feels "he's there" in relation to the original problem focus.

T: *Charles, does your theory also take into consideration the fact that . . . ?*

Giving Free Data refers only to those instances when the teacher gives data to the student without his specifically requesting it. When a student does request specific data and the teacher responds by giving that data, the teacher is using the behavior called Responding To Student's Data Generating.

GIVING THEORIES (GT)

Occasionally a teacher may wish to diagnose how the students value inquiry as a way of working. One way to find out is to give the students a theory in relation to a problem event. If they accept the theory and stop inquiring, it would suggest that the student does not, as yet, really view inquiry as a way to come to understand the meaning of theories or to solve a problem. If, on the other hand, the student moves to "try out" the theory given him by the teacher, it can be inferred that he has come to value inquiry as a way to find out what meaning and power ideas have for him. To do this, teachers may use a behavior called Giving Theories.

T: *So far, we have several theories from the group about this problem. Here is another possible theory that hasn't been mentioned . . . .*

SUMMARY OF COMMON ERRORS IN USING THE INQUIRY DIAGNOSTIC TEACHING BEHAVIORS

GENERAL ERRORS:

The diagnostic teaching behaviors are used incorrectly when:

- These teaching behaviors exceed more than 10% of all teaching behaviors used in a lesson.
- The teacher uses them to badger or put students on the spot to teach them who's "boss."
- The teacher feels that the student will probably be unable to respond appropriately.

THE PROBE FOR PREDICTION EXPLANATION (PPE) teaching behavior is used incorrectly when:

- The student is asked to predict something unrelated to his theory.
- The teacher uses it in a "You should be able to predict this event with your theory" context.

THE PROBE FOR STUDENT'S THEORY (PST) teaching behavior is used incorrectly when:

- The teacher is not relatively certain the student does have a theory to report.

THE PROBE FOR STATUS OF STUDENT'S THEORY (PSST) teaching behavior is used incorrectly when:

- It is used before the student has tested his theory; before he has a data base from which he can make this kind of a judgement.

- It is used only in those situations in which a student has generated that disproves his theory.

THE PROBE FOR FEELINGS (PF) teaching behavior is used incorrectly when:

- It is directed to the individual rather than to the group.

THE GIVING FREE DATA (GFD) teaching behavior is used incorrectly when:

- The teacher's motivation is to "straighten out" the student or tell them something the teacher feels they should know.

THE GIVING THEORIES (GT) teaching behavior is used incorrectly when:

- A theory is given to the students before the teacher has some evidence that the students are able to test out their theories for themselves.

Dalstra Inquiry Teaching Strategy
Inservice Education Program

AN INQUIRY LESSON

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AN INQUIRY LESSON

Inquiry lessons may be structured in different ways. The sizes of the groups may range from an entire class to an individual teacher working with one student. Some inquiry lessons may begin and end on the same day while some may range over the course of several weeks or months. Problems suitable for classroom inquiry, that is, a problem that has an explanation which can be expressed at various levels of complexity, may be drawn from many different curricular areas. However, despite these obvious differences, all inquiry lessons have two things in common. They all include a time when the students work to build and test an explanation and a time when they discuss ways of working to build and test their explanation. The terms, EXPLANATION BUILDING AND TESTING and PROCESS DIALOGUE are used to label these two parts of an inquiry lesson.

EXPLANATION BUILDING AND TESTING

During the portion of the lesson when the students build and test their explanation they direct their intellectual energies to such issues as:

How do I explain why the towns are located where they are:

What major transportation routes go through there?

Did closeness to the river have anything to do with it?

PROCESS DIALOGUE

During the student's dialogue about the problem solving process, they direct their intellectual energies to such issues as:

How do I go about building an explanation or solution for this problem?

How do I decide what data I'll need and how I'll get it?

How do I know when my theory is a good one?

In summary, the explanation building and testing part of an inquiry lesson provides an opportunity for students to experience the act of building and testing explanations for themselves. The Process Dialogue portion of the lesson helps students mediate their experience by reflecting on the range, power, and effectiveness of the various inquiry processes and strategies they used. And extending the students' productive repertoire of inquiry processes and strategies is what Teaching Toward Inquiry is all about.